BDM

INTELLIGENCE AND ELECTRONIC WARFARE (IEW) STREAMLINING PROJECT

Volume II
Directives and Related Study Documents
Revised November 18, 1992

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	18 Nov 92	INTERIM

4. TITLE AND SUBTITLE

Intelligence and Electronic Warfare (IEW) Streamlining Project, Volume II, Directives and Related Study Documents

5. FUNDING NUMBERS

C OPM-91-2964
PR 02TO2K

6. AUTHOR(S)

David P. Nicholas (compiler)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

BDM International, Inc., 825 Diligence Drive, Suite 200, Newport News, VA 23606

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Army Communications-Electronics Command Intelligence Materiel Management Center (USACIMMC), ATTN: SELIM-IEW, Vint Hill Farms Station, Warrenton, VA 22186-5277

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

Prepared under contract with U.S. Office of Personnel Management, Office of Employee Development Policy and Programs, Training Assistance and Organizational Development Division

12a. DISTRIBUTION/AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

Purpose of study was to recommend improvements in logistics support for Army intelligence and electronic warfare (IEW) equipment. Report analyzes existing sustainment system and recommends a number of systemic improvements to integrate and streamline the sustainment of IEW materiel. The recommended objective concept includes centralized control of regional sustainment assets (including contracts providing sustainment) under Army Materiel Command; organizational changes to integrate soldier, civilian, and contract resources; improved distribution and control of spares; improved deployment capability; and provisions to enhance technology transfer between contractors, civilians, and soldiers.

The IEW Streamlining Study Sustainment Analysis Report consists of four volumes, some multipart. Volume IV, which is classified, may be obtained from the Defense Technical Information Center, Cameron Station, Bldg. 5, ATTN: Acquisition-OCP, Alexandria, VA 22304-6145. Study documents are as follows:

- Volume I, Sustainment Analysis Report, revised 30 Oct 92
- Volume II, Directives and Related Study Documents, revised 18 Nov 92
- Volume III, Reference Documentation (Part 1), 1 Sep 92
- Volume III, Reference Documentation (Part 2), 1 Sep 92
- Volume III, Reference Documentation (Part 3), 1 Sep 92
- Volume III, Reference Documentation (Part 4), 1 Sep 92
- Volume III, Reference Documentation (Part 5), 18 Nov 92
- Volume IV, Systems Sustainment (Part 1)(classified), 1 Sep 92
- Volume IV, Systems Sustainment (Part 2)(classified), 1 Sep 92

14. SUBJECT TERMS

intelligence and electronic warfare (IEW)	materiel
sustainment	maintenance
low density	nondevelopmental item (NDI)

15. NUMBER OF PAGES 286

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

IEW STREAMLINING PROJECT

Volume II

Directives and Related Study Documents

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Under Contract Number OPM-91-2964 With
U.S. Office of Personnel Management
Office of Employee Development Policy and Programs
Training Assistance and Organizational Development Division

Project Title: Logistics Support
Work Order: 7064-006
Project Code: 02T02K

November 18, 1992

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Appendix A

AMC Letter, 20 Aug 91, to VCSA, IEW Streamlining

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY MATERIEL COMMAND
5001 EISENHOWER AVENUE, ALEXANDRIA, VA 22333-0001

August 20, 1991

General Dennis J. Reimer
Vice Chief of Staff
United States Army
Washington, D.C. 20310-0200

Dear General Reimer:

Operation Desert Shield and Desert Storm brought into use the plethora of Intelligence and Electronic Warfare (IEW) equipment in our Military Intelligence (MI) units, and tested our support systems. Shortcomings were encountered and problems overcome in these support systems by using bandages which were rapidly applied through the diligent efforts of developers, logisticians, and users. We now need to institutionalize these lessons learned to improve future IEW sustainment.

Our support challenges resulted in large part from the different support mechanisms planned by multiple Army organizations who each developed, procured, and provided materiel to MI units. The Program Executive Officer for Intelligence and Electronic Warfare procured and fielded major systems such as TRAILBLAZER, TRAFFICJAM, and TACJAM into the force structure worldwide. The U.S. Army Forces Command (FORSCOM) deployed Non-Developmental Items (NDI) such as MICROFIX, DRAGONFIX, and COLDWING (to FORSCOM and U.S. Army Reserve units only). The U.S. Army Intelligence and Security Command (INSCOM) also deployed a myriad of systems to both echelon above and below corps ranging from non-developmental to antiquated items. Individual major Army commands often used their own support system for materiel purchased for training or experimental purposes. These actions resulted in diverse support channels which were sometimes unfamiliar to Army maintenance support units, hampered theater support planning and created a substantial burden for MI units. What was practical in peacetime became extremely difficult to execute in wartime.

In response to this situation, a single integrated support structure called the RAINBOW Special Repair Activity (SRA) was planned and implemented by U.S. Army Materiel Command (AMC). To meet customer requirements, SRAs were located at Vint Hill Farms Station, Virginia, Dhahran, Riyadh, and King Khalid Military City. They consisted of a combination of Army units, civilian, and contractor personnel. This concept proved extremely successful, and contributed to consistently high readiness rates and responsive logistic support.

Encl 3

I am committed to providing the finest possible support to intelligence and electronic warfare systems and in streamlining their sustainment base. However, there are still systems being developed by non-PEO or non-AMC PMs that are creating or using duplicative nonstandard support. Regardless of how they got to where they are, I am convinced that systems such as TENCAP, TROJAN, and others can be supported as well or better than they are today at lower operation and support costs.

The Commanding General, U.S. Army Communications-Electronics Command, recently briefed me on opportunities to consolidate IEW logistic support that would reduce these multiple support mechanisms while also providing manpower and dollar savings by minimizing duplication of effort. The fundamental approach is to assign logistics management to a single AMC organization. By focusing responsibility on one organization, common logistics tasks and skills can be consolidated across various IEW systems. Multiple support contracts, and multiple contractors who often sit side by side, can be consolidated thus reducing direct as well as overhead costs of both contractors and in-house Army management personnel. Additionally, the number of warehouses and maintenance shops can be reduced.

Based on one consolidation I am undertaking in AMC, Lieutenant General Eichelberger recently requested AMC work with INSCOM to conduct a study of the logistics intelligence process to highlight other key areas. The objective is to implement streamlining measures that could best benefit the need to rapidly accommodate improving technology while reducing duplication and layering through logistics consolidation. My staff will be briefing our ideas to him in mid-August. I ask your support so we can meet the challenge of improving intelligence sustainment in a downsized force structure at a lower cost.

Respectfully,

William G. T. Tuttle

WILLIAM G. T. TUTTLE, JR.
General, U.S. Army
Commanding

Copies Furnished:

Lieutenant General Jimmy D. Ross
Deputy Chief of Staff for Logistics
Department of the Army
Washington, D.C. 20310-0500

Lieutenant General C. B. Eichelberger
Deputy Chief of Staff for Intelligence
Department of the Army
Washington, D.C. 20310-1001

Major General Charles F. Scanlon
Commander
United States Army Intelligence and
Security Command
Fort Belvoir, Virginia 22060-5370

Appendix B

INSCOM Memo, 28 Oct 91, Subj: Logistics Study for Intelligence and Electronic Warfare (IEW) Equipment and Non-Developmental Items (NDI)

DEPARTMENT OF THE ARMY

UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND

FORT BELVOIR, VIRGINIA 22060-5370

REPLY TO
ATTENTION OF

IALOG (70-17b)

28 October 1991

MEMORANDUM FOR HQDA (DAMI), WASH DC 20310-1001

SUBJECT: Logistics Study for Intelligence and Electronic Warfare (IEW) Equipment and Non-Developmental Items (NDI)

1. In his 20 August 1991 letter to the Vice Chief of Staff, Army, General Tuttle proposed a study of the acquisition and support to non-developmental intelligence and electronic warfare systems. It is my understanding from Mr. Jim Davis, that the Deputy Chief of Staff for Intelligence will support such an effort and will recommend that the Intelligence and Security Command be a full participant.

2. We fully support this study and believe that we can make a contribution to developing doctrine and policy for improved support to IEW/NDI systems based upon both our DESERT STORM experiences and years of managing support to NDI systems in Army field stations.

3. Ideally, this effort will produce new definitions for NDI as it applies to intelligence operations, and will propose support thresholds of management and responsibility which would provide the major Army command (MACOM) commanders a quick reaction capability to "weight" the intelligence battle with new technologies and high systems readiness. Our experience in support to CRAZYHORSE and TROJAN has proven that this can be done cost effectively with a lean "green suit" structure and judicious use of contractor support. We are looking forward to presenting our concepts and recommendations to the study group and to hearing those of other MACOMs.

4. Transportation and distribution of support to fielded systems, whether NDI or standard, may well remain our greatest logistics challenge. And to this end, we recommend that Department of the Army, Deputy Chief of Staff for Logistics be a full participant in the effort. Further information concerning this may be obtained from COL Paul Gill, AV 229-1348 or coml (703) 706-1348.

CHARLES F. SCANLON
Major General, USA
Commanding

.G-S
JECT: Logistics Study for Intelligence and Electronic Warfare EW) Equipment and Non-Developmental Items (NDI)

CF:
VICE CHIEF OF STAFF, ARMY, ATTN: DACS-ZB
DEPUTY CHIEF OF STAFF FOR LOGISTICS, ATTN: DALO

COMMANDER
ARMY MATERIEL COMMAND, ATTN: AMCCG

Appendix C

VCSA Letter, 1 Nov 91, to Cdr, USAMC, IEW Streamlining

Cf: C/s

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF STAFF
WASHINGTON, DC 20310-0200

01 NOV 1991

General William G. T. Tuttle, Jr.
Commander
United States Army Materiel Command
Alexandria, Virginia 22333-0001

Dear General ~~Tuttle~~ Bill:

In response to your 20 August 1991 letter, I wholeheartedly agree that a close look should be given to our future Intelligence and Electronic Warfare (IEW) sustainment. The lessons learned from the many commendable initiatives employed during DESERT SHIELD and DESERT STORM such as the RAINBOW Special Repair Activity, need to be captured, where feasible, to further streamline our efforts and reduce duplication.

AMC's accomplishments in this area have opened the door for a broader, in-depth systemic review. Accordingly, I have directed the Army Staff to conduct a system-by-system review of battlefield IEW for all echelons of sustainment. A message will follow designating AMC to lead the effort and asking TRADOC, FORSCOM, and INSCOM to participate.

I fully support your efforts to improve our warfighting ability and believe that advances in IEW battlefield sustainment will also lead to improvements for the other battlefield operating systems. I look forward with great interest to the results of your efforts.

Sincerely,

Denny

DENNIS J. REIMER
General, United States Army
Vice Chief of Staff

Copies Furnished:

Lieutenant General J. H. Binford Peay, III
Deputy Chief of Staff for Operations and Plans
Department of the Army
Washington, D.C. 20310-0400

Lieutenant General Jimmy D. Ross
Deputy Chief of Staff for Logistics
Department of the Army
Washington, D.C. 20310-0500

Major General Ira C. Owens
Deputy Chief of Staff for Intelligence
Department of the Army
Washington, D.C. 20310-1001

Appendix D

VCSA Message, 012000Z Nov 91, Subj: Intelligence and Electronic Warfare (IEW) Battlefield Sustainment

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01 02 012000 ~~OCT~~ NOV 91 PP PP UUUU

FM HQDA WASH DC//DACS-ZB//

TO CDRAMC ALEXANDRIA VA//AMCCG//

CDR TRADOC FT MONROE VA//ATCG//

CDR FORSCOM FT MCPHERSON GA//FCCG//

CDR INSCOM FT BELVOIR VA//IACG//

UNCLAS

PERSONAL FOR GEN TUTTLE, CG, AMC; GEN FRANKS, CG, TRADOC; GEN BURBA, CG, FORSCOM; MG SCANLON, CG, INSCOM;

FROM GEN REIMER, VCSA, HQDA

SUBJECT: INTELLIGENCE AND ELECTRONIC WARFARE (IEW) BATTLEFIELD SUSTAINMENT

1. BASED ON LESSONS LEARNED DURING OPERATION DESERT SHIELD/STORM (DSS) I HAVE APPROVED AN IN-DEPTH ANALYSIS OF IEW BATTLEFIELD SUSTAINMENT WITH SPECIFIC FOCUS ON THE MULTIPLE CHANNELS THAT DEVELOPED IN SUPPORT OF DSS. SEVERAL FACTORS INDICATE THAT THE TIME IS RIGHT TO CONDUCT THIS ANALYSIS. WITH THE INCREASING COMPLEXITY OF BATTLEFIELD SYSTEMS AND THE PROLIFERATION OF NONDEVELOPMENTAL AND PROTOTYPE ADVANCED TECHNOLOGY, CONTRACTOR SUPPORT HAS BECOME A KEY CONSIDERATION ON THE AIRLAND

LEWIS H. THOMPSON, MAJ, GS

DAMO-FDI/54256/26SEP91

DENNIS J. REIMER, GEN, VCSA

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02 02 OCT 91 PP PP UUUU

BATTLEFIELD. DECLINING RESOURCES NECESSITATE THAT WE ACHIEVE ECONOMIES OF SCALE WHERE POSSIBLE IN ORDER TO REDUCE COSTS. FINALLY, COMMON SENSE TELLS US THAT SOLDIERS IN BATTLE NEED CLEAR CHANNELS OF RESPONSIBILITY FOR REPAIR OF CRUCIAL SYSTEMS.

2. ACCORDINGLY, THE OBJECTIVE OF THIS ANALYSIS IS TO DETERMINE HOW TO INTEGRATE AND STREAMLINE BATTLEFIELD SUSTAINMENT OF IEW OPERATIONS ON A DYNAMIC AND AUSTERE AIRLAND BATTLEFIELD, WITH PARTICULAR FOCUS ON SUPPORT TO KEY, ADVANCED TECHNOLOGY NDI AND PROTOTYPE SYSTEMS. AMC WILL LEAD THE EFFORT AND PROVIDE PERIODIC IPRS AND A FINAL REPORT TO THE ARMY STAFF. TRADOC, FORSCOM, AND INSCOM ARE INVITED TO PARTICIPATE TO BRING THE RIGHT MIX OF DOCTRINE, ECB, AND EAC REPRESENTATION INTO THE EFFORT.

3. JOINT EFFORTS BETWEEN THE ARMY STAFF AND AMC BEGUN LAST YEAR HAVE CREATED AN ENVIRONMENT OF SIGNIFICANT OPPORTUNITY IN THIS AREA. THE EFFORT HOLDS CLEAR POTENTIAL FOR PAYOFF BEYOND THE IEW MISSION AREA. I LOOK FORWARD TO THE RESULTS. REGARDS - DENNY.

LEWIS H. THOMPSON, MAJ, GS

DAMO-FDI/54256/26SEP91

DENNIS J. REIMER, GEN, VCSA

UNCLASSIFIED

Appendix E

CIMMC MFR, 6 Dec 91, Subj: 2 December IEW Streamlining HQ DA Guidance Meeting

C DEC 1991

SELIM-PA (700)

MEMORANDUM FOR RECORD

SUBJECT: 2 December IEW Streamlining HQ DA Guidance Meeting

1. The purpose of this MFR is to document the HQ DA guidance provided for the 11 December 91 IPR.

2. The attendees were as follows:

LTC Knight	DAMI-PI
Major Thompson	DAMO-FDI
Mr. Dan Demchak	DALO-SMC
Mr. Helmut Schelenz	DALO-SMC
Mr. Larry Scheuble	USACIMMC
Mr. Dennis Dutton	USACIMMC

3. Study Team: The DA Staff reaffirmed AMC (USACIMMC) to be the lead for this study and would chair the 11 December IPR hosted by DAMO-FDI. Each of the DA players had received contact from other MACOMs and PEO-IEW looking for more detailed guidance. The feedback provided from the DA Staff was that the 11 December IPR would be a working level meeting to discuss the concept for the study. It was mutually agreed that by name players from each of the MACOMs was still at issue and USACIMMC should pursue the POC assignment. Mr. Scheuble agreed to make personal phone calls to key personnel associated with the respective LOG groups and follow-up with a message requesting POC designation (Encl).

4. The following DA guidance was provided to assist in building a framework for the study:

a. MI Relook - USACIMMC was cautioned in the use of the MI Relook as all the results are not in synchronization with the TAA and other key planning documents. LTC Knight offered Mr. Rod Isler, (703) 695-4026, as a POC for MI Relook and Col Dave Mankowski (703) 671-8680, as the POC for implementation of the Solution Set.

b. IEW Modernization Plan - The DA Staff felt the baseline for any analysis of the Force of the Future would have to be the IEW Modernization Plan. However, the study team should understand the RC MI Force Structure is in a high degree of flux and may necessitate the development of a DA RC model for use with the study.

SELIM-PA
SUBJECT: 2 December IEW Streamlining HQ DA Guidance Meeting

c. Major Thompson stated the study objective must include designing a sustainment base for War and then modifying it for peacetime application. In addition, the results must support the JCS/Army Planning Guidance to insure a flexible sustainment base capable of rapid deployment.

d. The scope of the study should largely focus on four elements as follows:

(1) Pre-Desert Shield Sustainment

(2) Desert Shield/Storm to include:

(a) Movement In and Out.

(b) ECB and EAC assets.

(c) Problems and Successes.

(d) Problems should point to a specific area such as materiel, doctrine, training, organization/operational procedures, etc.

(e) Fixes to the problem.

(3) Post Desert Storm/Near Term (FY91-95) Sustainment.

(4) Future Sustainment/Long Term-Posture/Needs/etc.

e. The agenda proposed for the December IPR is as follows:

* Opening Remarks - DAMO-FDI
* Study Plan - USACIMMC
  - Scope
  - Objectives
  - Timeframe
* Open Discussion - Study Team

5. Point of contact is the undersigned at DSN 229-6340.

6. CECOM Bottom Line: THE SOLIDER.

Dennis F. Dutton

DENNIS F. DUTTON
Projects Officer
SELIM-PA, IMMC

Encl

SELIM-PA
SUBJECT: 2 December IEW Streamlining HQ DA Guidance Meeting

CF:
AMSEL-CG
AMSEL-LC
DAMO-FDI (Major Thompson)
DAMI-PI (LTC Knight)
DALO-SMC (Mr. Demchak)
AMCLG-SID (Mr. Shelton)

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MESSAGE HANDLING INSTRUCTIONS

FROM: DIR USACIMMC VHFS WARRENTON VA//SELIM-DIR//

TO: CDR FORSCOM FT MCPHERSON GA//FCCG/FCJ2//

CDR TRADOC FT MONROE VA//ATCG/ATD-G//

CDR INSCOM FT BELVOIR VA//IACG/IALOG//

INFO HQ DA WASH DC//DAMO-FDI/DALO-SMC/DAMI-PI//

CDR AMC ALEXANDRIA VA//AMCLG/AMCLG-SID//

CDR CECOM FT MONMOUTH NJ//AMSEL-CG/AMSEL-LC//

CDR USAIC-FT HUACHUCA AZ//ATSI-CG/CDG//

PEO-IEW VHFS WARRENTON VA//SFAE-IEW//

UNCLAS

QQQQ

SUBJ: INTELLIGENCE AND ELECTRONIC WARFARE (IEW) SUSTAINMENT

HQ DA DACS-ZB PERSONAL FOR MSG 012000Z NOV 91 SAB (U)

B. HQ AMC AMCCS PERSONAL FOR MSG 012000Z NOV 91 SAB (U)

C. HQ DA DAMO-FDI MSG NOV 91 SUBJECT: IEW SYSTEMS SUSTAINMENT ANALYSIS AND REVIEW

1. ABOVE REFERENCE CORRESPONDENCE ELICITED SUPPORT TO EVALUATE

DISTR:

DRAFTER TYPED NAME, TITLE, OFFICE SYMBOL, PHONE

LARRY D. SCHEUBLE, DIR, SELIM-DIR, 5011

SPECIAL INSTRUCTIONS

TYPED NAME, TITLE, OFFICE SYMBOL AND PHONE

LARRY D. SCHEUBLE, DIR, SELIM-DIR, 5011

SIGNATURE

Larry D. Scheuble

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PAGE	DATE TIME	MONTH	YR	PRECEDENCE ACT	PRECEDENCE INFO	CLASS	SPECAT	LMF	CIC	ORIG/MSG IDENT
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BOOK | MESSAGE HANDLING INSTRUCTIONS

INTELLIGENCE AND ELECTRONIC WARFARE (IEW) SUSTAINMENT STREAMLINING FOR THE ARMY. THE LEAD FOR THIS STUDY HAS BEEN GIVEN TO ARMY MATERIEL COMMAND AND SUBSEQUENTLY TO CECOM (IMMC), THE AMC INTELLIGENCE LOGISTICS MANAGER. THE FIRST IPR, SCHEDULED TO BE HELD ON 11 DECEMBER, IS FOR A WORKING LEVEL DISCUSSION TO DESCRIBE THE TIMELINE, SCOPE, OBJECTIVE, ETC., FOR THIS STUDY AND WILL BE HOSTED BY THE DADCSOPS-FDI.

2. THE PURPOSE OF THIS MESSAGE IS TO REQUEST BY NAME POINT OF CONTACTS FOR PARTICIPATION IN THIS STUDY EFFORT NLT 9 DEC 91. THE USACIMMC WILL CONTINUE TO LEAD THE EFFORT FOR AMC AND WILL PROVIDE THE BASIC CRITERIA FOR STUDY AND THE OBJECTIVES FOR COMPLETION IN A TIMELY FASHION.

3. AS PART OF THE STUDY TEAM THE PARTICIPANTS FROM YOUR MACOM SHOULD BE PREPARED TO MAKE COMMITMENTS FOR THE COMMAND IN ADDITION TO CONSULTATION, GUIDANCE, DIRECTION, INNOVATIVE IDEAS ON HOW TO REALIGN AND IMPROVE IEW SUSTAINMENT AS THE MILITARY INTELLIGENCE STRUCTURE IS BUILT DOWN TO MEET MI 2000 AND MI MODERNIZATION PLANS. THIS BUILD DOWN IS PART OF THE TOTAL ARMY BUILD DOWN AND IS

DISTR:

DRAFTER TYPED NAME, TITLE, OFFICE SYMBOL, PHONE: LARRY D. SCHEUBLE, DIR, SELIM-DIR, 5011

SPECIAL INSTRUCTIONS

RELEASER TYPED NAME, TITLE, OFFICE SYMBOL AND PHONE: LARRY D. SCHEUBLE, DIR, SELIM-DIR, 5011

SIGNATURE: LDS

SECURITY CLASSIFICATION: UNCLASSIFIED

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BOOK | MESSAGE HANDLING INSTRUCTIONS

ANTICIPATED TO RESULT IN SIGNIFICANT CHANGE TO THE MULTITUDE OF SUSTAINMENT TO MECHANISMS CURRENTLY IN PLACE.

4. POC IS MR. DENNIS DUTTON, USACIMMC, SELIM-PA, DSN 229-6340 {VOICE} AND {703} 349-0023 {FAX}.

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DISTR:

DRAFTER TYPED NAME, TITLE, OFFICE SYMBOL, PHONE

LARRY D. SCHEUBLE, DIR, SELIM-DIR, 5011

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SIGNATURE

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Appendix F

CIMMC, Project Design Document, 14 Apr 92, Subj: Intelligence and Electronic Warfare (IEW) Battlefield Sustainment Logistics Streamlining

INTELLIGENCE AND ELECTRONIC WARFARE (IEW) BATTLEFIELD SUSTAINMENT LOGISTICS STREAMLINING

Project Design Document

Developed For:

The U.S. Army Materiel Command

Developed By:

The U.S. Army CECOM
Intelligence Materiel Management Center

14 April 1992
(Revised)

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PROJECT SYNOPSIS

Background

During Desert Shield and Desert Storm (DSS), AMC and individual Major Army Commands (MACOMs) often used unique individual support systems to provide material supply, maintenance, training, and documentation in providing logistic support. A history of IEW sustainment fragmentation has resulted in:

- A myriad of non-integrated logistics processes. Military Intelligence units forced to cope with a wide variety of diverse processes and procedures in order to achieve the necessary logistic support.
- Heavy reliance on multiple contractors for various systems, producing multiple channels of support.
- Higher support cost (maintenance and supply).
- Needless Duplication.
- Optimized peacetime system readiness at the potential expense of readiness during deployed operations.

Lessons learned from DSS, Defense Management Review Decisions recommended streamlining and consolidation. The reality of decreasing budgets, dictate that the Army's process for sustaining crucial IEW equipment become more standardized, simpler and efficient, as well as more cost effective.

At the direction of the Vice Chief of Staff of the Army, the Army Material Command (AMC) is undertaking a project aimed at achieving these results. The CECOM Intelligence Material Management Center (CIMMC), as AMC's focal point for the sustainment of intelligence related equipment, will coordinate and oversee the study.

Agency Goals

The anticipated results from the Logistics Streamlining study are:

- Centralize wholesale logistics under AMC.
- The development and institutionalization of a sustainment process for IEW equipment which is designed to function effectively in both peace and war.
- The development of accompanying doctrine suitable to the needs of both users and developers.

- Increased readiness at decreased costs.

AGENCY OBJECTIVE

Introduction

The Army's overall goal for this project is to streamline the logistics support structure for IEW equipment, thereby increasing readiness and decreasing costs.

Target Population

The target population for products delivered under this project is the Intelligence Community and Department of Defense Support Organizations.

Tasks for Which Performance is To Improve

After completion of the IEW Logistics Streamlining project, the Army's process for fielding and sustaining its IEW equipment can be expected to be:

- Standardized.
- Simpler.
- More Timely.
- More cost-effective.
- Higher in quality.
- More user friendly.

As a result of these improvements, U.S. Armed Forces will experience improved readiness in peace and increased effectiveness during conflict.

PROJECT CONTEXT

Plan Assumptions

This plan was prepared using a 13-month timeline in order to:

- Identify ways to improve the sustainment process for IEW equipment as soon as possible.
- Allow sufficient time for analysis.
- Synchronize with the budget process.
- Provide lessons learned for application to MI FAA.

The timeline and level of effort are based upon the following assumptions:

- Department of the Army In-process Reviews (IPRs) will occur at approximately 60 day intervals at the Pentagon.
- Major Army Command IPRs will occur around 30 day intervals in locations agreeable to the participants.
- The contractor will provide project status and conference reports in support of all IPR's.
- The CIMMC, as AMC's lead organization for the project, will act as overall project coordinator. In this capacity the CIMMC will:

  -Serve as the contractor's primary interface in all matters relating to the project.
  -Facilitate all necessary cross-organization coordination.

- The CIMMC will review and approve all deliverables for acceptability.
- A maximum of two (2) drafts will be provided for any deliverable.

Indeed, 13 months will not allow an in-depth analysis across the entire breadth of intelligence sustainment. Where necessary, some concerns identified by the project may be the topics of follow-on analysis as a means of assuring for the continuous improvement of sustainment procedures.

Plan Summary

The following section specifies the conceptual framework for the integrated project.

NARRATIVE PLAN SUMMARY

Introduction

Given the specialized and technical nature of this project, some additional background is required. This section will provide that background and will outline the main elements of the study approach now being considered by the Army.

As noted earlier, Operations Desert Shield and Desert Storm highlighted some significant problems in the way the Army provides logistics support for its IEW equipment. The principal problem is that the process has become extremely fragmented. This problem has several causes:

- IEW equipments are typically expensive, very complex, high priority, and low density systems. These factors have encouraged the establishment of "special" or one-of-a-kind support mechanisms.
- IEW equipments have been deployed which were initially designated for training and/or experimental purposes. These non-standard systems have unique support arrangements which cause additional complexity to wartime support planning and implementation.
- The need to protect the capabilities of IEW equipments for security reasons has further encouraged the establishment of special support mechanisms.

As a result of this fragmentation, the logistics development process has failed to optimize the utilization of organic resources and has become costly and inefficient. The AMC Commander believes the institutionalization of a disciplined, streamlined support process for IEW equipment would: improve readiness; increase quick reaction capability; increase control and flexibility, and decrease costs to the Army as a whole.

Project Relationships

In an effort to develop an improved process, the Army is undertaking this project. To ensure this project is as comprehensive as possible, the Army is including key organizations in the IEW equipment sustainment process. These organizations include:

- The Army Materiel Command (AMC) which is charged with project oversight. This oversight is primarily exercised through its subordinate organization, the CECOM Intelligence Materiel Management Center (CIMMC).
- The Training and Doctrine Command (TRADOC) to provide doctrinal guidance.
- Forces Command (FORSCOM) to address concerns of Echelon Above Corps (EAC) and Echelon Corps and Below (ECB) tactical MI systems.
- The Intelligence and Security Command (INSCOM) to address concerns of unique INSCOM EAC systems.
- The United States Army Special Operations Command (USASOC) to address unique concerns of special mission forces for sustainment of SOF unique as well as army standard equipment.
- The Program Executive Officer for Intelligence and Electronic Warfare (PEO-IEW) to address concerns of IEW systems acquisition.
- The Deputy Chiefs of Staff of the Army for; Operations, Intelligence, and Logistics to provide Headquarters, Department of the Army guidelines.

Special Considerations

Development of the streamlined support structure must consider the following:

- The special support requirements of IEW equipment with a focus on supporting the Airland Battle future.
- The role of Non-Developmental Items (NDI).
- The support implications of peace time versus war time environments.

- Compliance with the Defense Management Review Decision (DMRD) focused on streamlining and consolidation in order to achieve increased economies and efficiencies within the Department of Defense.

- Contractor personnel must possess security clearances at the level of Top Secret/Special Intelligence.

Project Plan

As currently conceived, the project will:

- Address the entire spectrum of IEW across the Army and will include both active and reserve components.

- Provide an analysis addressing the baseline established for each of four discreet time periods;

  -Pre-Desert Shield.

  -Desert Shield/Storm.

  -Post Desert Storm (i.e. FY 1991-1995).

  -Future Requirements (FY 1995 and out).

- Consist of four phases;

  -Phase I - Planning.

  -Phase II.A - Data Collection.

  -Phase II.B - Analysis.

  -Phase III - Recommendation/Approval.

  -Phase IV - Implementation Plan Development.

Each phase will be discussed separately below.

Phase I - Planning

The planning phase provides for:

- Refinement of the project approach.

- Clarification of roles.
- Development of an administrative infrastructure.
- Project kick-off.

Phase II.A - Data Collection

During the Data Collection Phase, government employees and contractor personnel will be actively involved in the collection of data relating to IEW equipment sustainment flow encompassing maintenance, supply, training, and technical documentation for each of a specified set of equipments. This data will be collected:

- For the four specified time periods (i.e. pre-Desert Shield, during Desert Shield/Storm, post Desert Storm, and beyond FY 1995).
- For peacetime and wartime scenarios.
- Across the various intelligence disciplines.
- Across theaters of operations.
- For active and reserve components.

The deliverable for this phase will be the detailed documentation of the above with supporting automated data bases using DBASE III.

Phase II.B - Analysis

Once the requisite data has been collected for each of the specified equipments, two types of analysis must be performed:

(1) The standard Army sustainment process will be compared and contrasted to the sustainment process for IEW equipment. This comparison will address sustainment flows for both peacetime and wartime for the maintenance, supply, requisition, and materiel distribution processes. In addition, special logistics functions performed by the MACOMs participating in the study will be addressed.

In assessing the Army standard processes, the primary focus will be on Class VII and Class IX materiel. Consideration

will be given to unique handling procedures employed with vehicles, aircraft, communication security equipment, etc.

The product of this analysis will be a report which compares and contrasts the two sustainment processes highlighting commonalities and inconsistencies of the IEW requirements with the standard processes.

(2) The current IEW equipment sustainment process will be analyzed for its efficiency and effectiveness. In making this analysis, the following factors will be considered:

- Timeliness.
- Cost.
- Simplicity.
- Duplication.
- Customer Satisfaction.
- Justification of unique requirements.

The genesis of this analysis will be the establishment of the doctrinal baseline in support of Echelons Corps and Below (ECB) and Echelons Above Corps (EAC). Follow-on analysis will be conducted for a specified set of equipment which constitutes a representation of: ECB and EAC assets; Army Standard, Non-Standard, and NDI; Low-Density, Quick Reaction Capability; and future systems. The designated systems for study and criteria for selection are identified at Appendix B.

These equipments and associated sustainment mechanisms will be evaluated across baseline established within the four discreet time periods previously defined. Key to this analysis will be the identification of process anomalies and linkage to definable drivers such as developer, technology, security, users, etc. Initial data elements to be collected and analyzed for each system are delineated in Appendix C. In addition, where appropriate, the analysis shall at a minimum include:

- Targeted and actual levels of system readiness. These include:

-Measurement criteria employed.

-Sustainment costs.

-Driving forces associated with achieved levels of readiness (i.e., sparing concepts, sustainment impediments, product design deficiencies, etc.)

-Driving forces which determine target readiness requirements.

- Doctrinal compatibility with needs of the product users and the acquisition community.

- Doctrinal compatibility with product technology and institutionalized organic maintenance capabilities.

- Rapid deployability of sustainment processes at time of war.

- Feedback from the equipment users, sustainment personnel, acquisition managers and participating MACOM personnel.

The product of this analysis will be a series of reports which analyze the effectiveness and efficiency of the current IEW equipment sustainment processes.

3) Logistics documentation products of the NDI acquisition process will be evaluated for implications on sustainment requirements and capabilities in battlefield applications. The study will attempt to establish a DoD-D-5000.1 and DoD-I- 5000.2 baseline as a point of departure with follow-on analysis of NDI logistic products generated within PEO-IEW, INSCOM, FORSCOM, and USASOC.

4) Technology analysis of current and future systems will be evaluated from a maintenance perspective. This analysis will focus on current and future capabilities for embedded fault diagnostic and isolation as well as specific skills necessary to effect actual repair. In parallel, analysis of

the military occupational skills (MOSs) will be accomplished. The product of this analysis will be the comparison and contrasting of the technology bases and military training bases for insight into repair requirements and capabilities in support of the future MI technology architecture.

5) Distribution of support items and spares to using units as well as unserviceable retrograde have been identified as a key issue in reference to IEW support during Desert Shield/Storm. As noted, during discussion, these problems were problems for all Army units and do not reflect a unique situation to IEW sustainment at the Macro Level. Nonetheless, the specific needs of IEW, low density, will be assessed for potential recommendations.

6) Additionally, the study will analyze the current and future active force sustainment process relationships with the US Army Reserve, Army National Guard, other services and allies, as appropriate. This effort will focus on current and future equipment distributions, support structure and support capabilities/requirements.

Phase III - Recommendations Once the above analysis is complete, recommendations which modify existing logistics structures or create new ones will be formulated. These recommendations must include, at minimum, an assessment of the impacts of the following:

- DMRD 904, *Stock Funding of Reparables*.
- DMRD 927, *Retail and Wholesale Consolidation*.
- The reduction of the overall U.S. Army Force Structure .
- Base Realignment and Closures.
- The Strategic Logistics Agency's Integrated Sustainment Maintenance (ISM) concept.
- TRADOC's Electronic Maintenance Company Concept.
- AMC and CECOM Low Density Syndrome Studies.
- PEO-IEW Standard Module Open Architecture Concept.
- Military Intelligence Relook.

The deliverable for this project will be a detailed set of recommendations to include full analysis associated with alternatives considered in the development of the final recommendations.

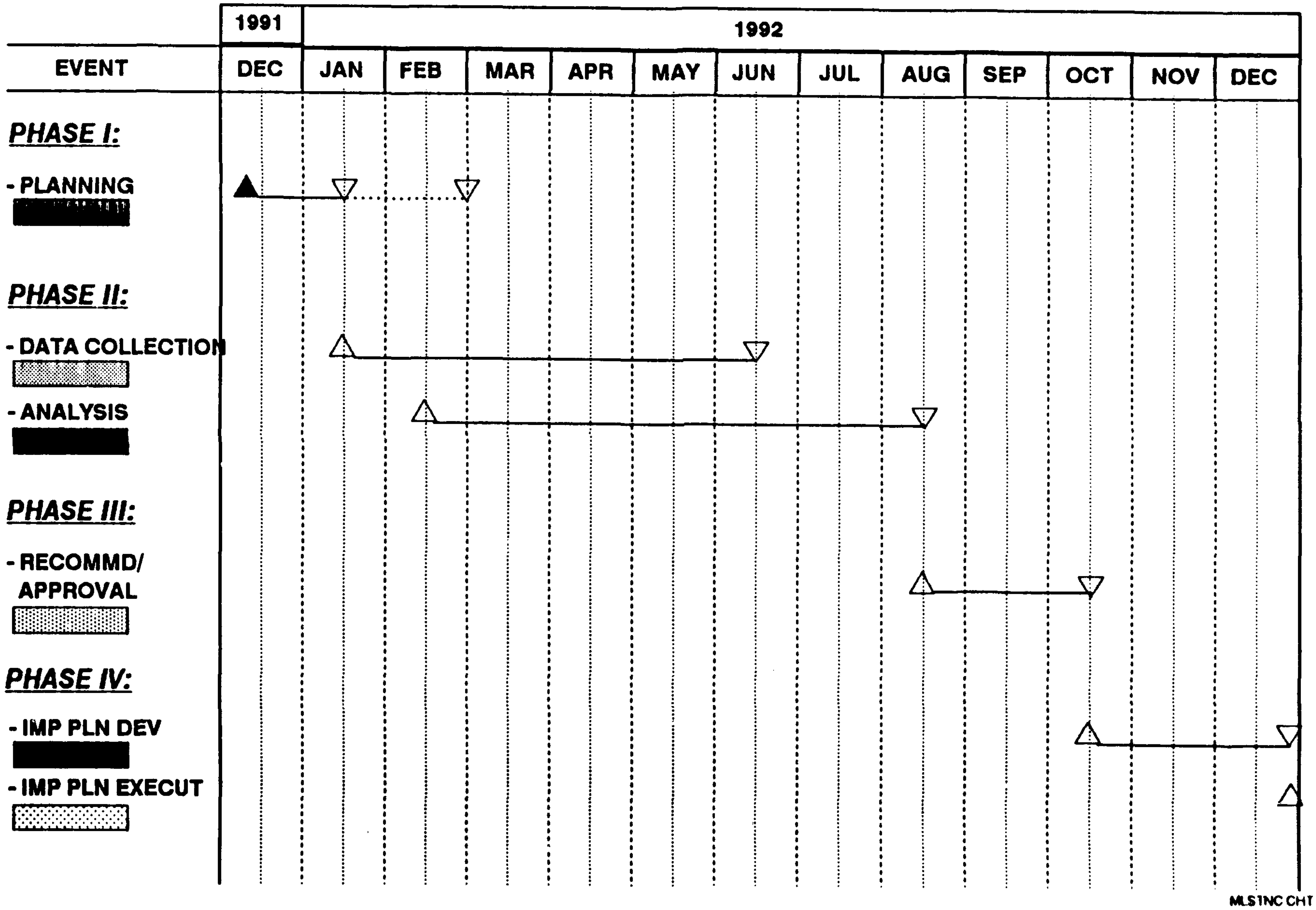
Phase IV - Implementation Plan Development Based upon its review of the recommendations, the Army may seek contractor assistance in implementation.

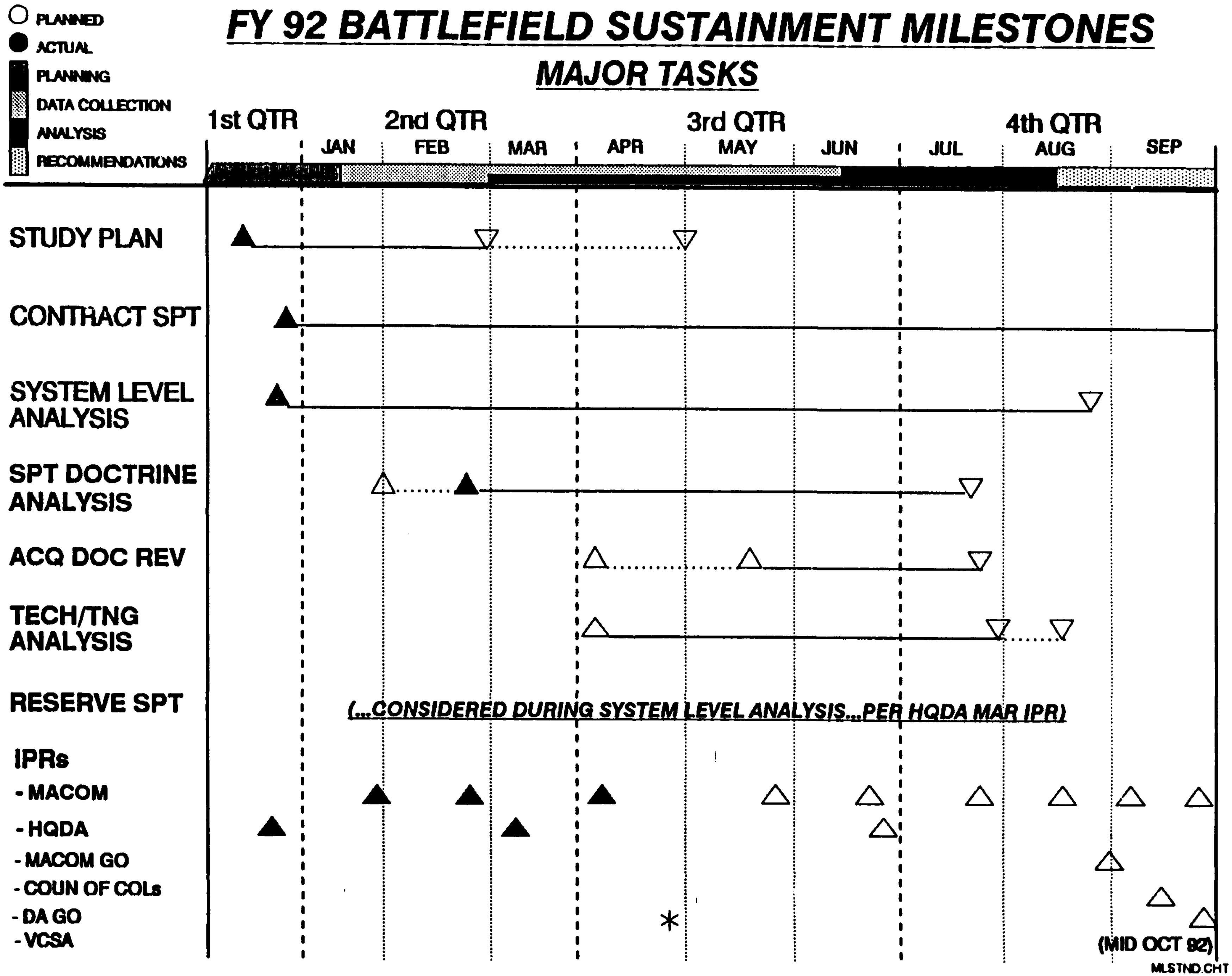
Appendix A

Logistics Streamlining Project Schedule By Phase

IEW BATTLEFIELD SUSTAINMENT MILESTONES

STUDY PHASES

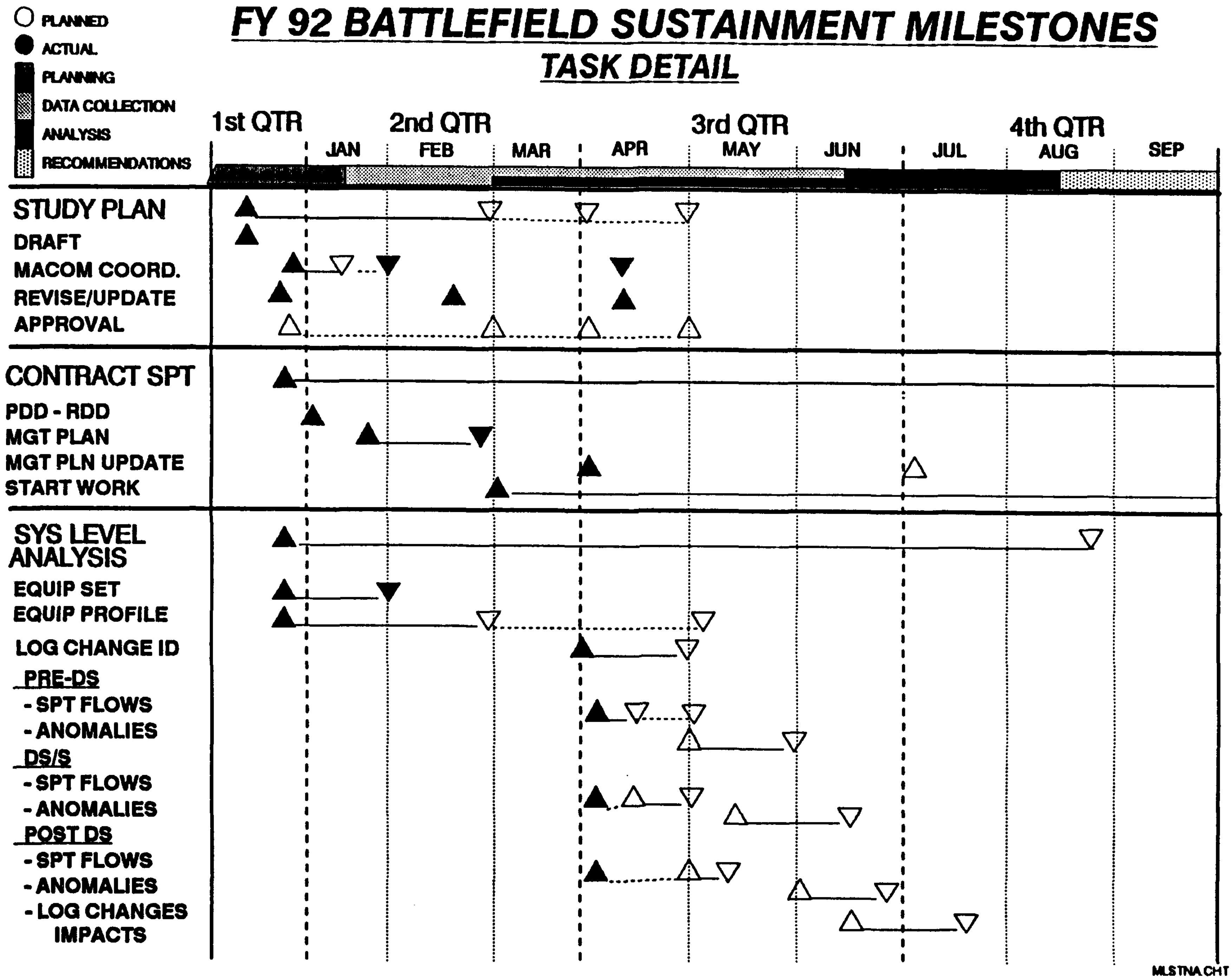




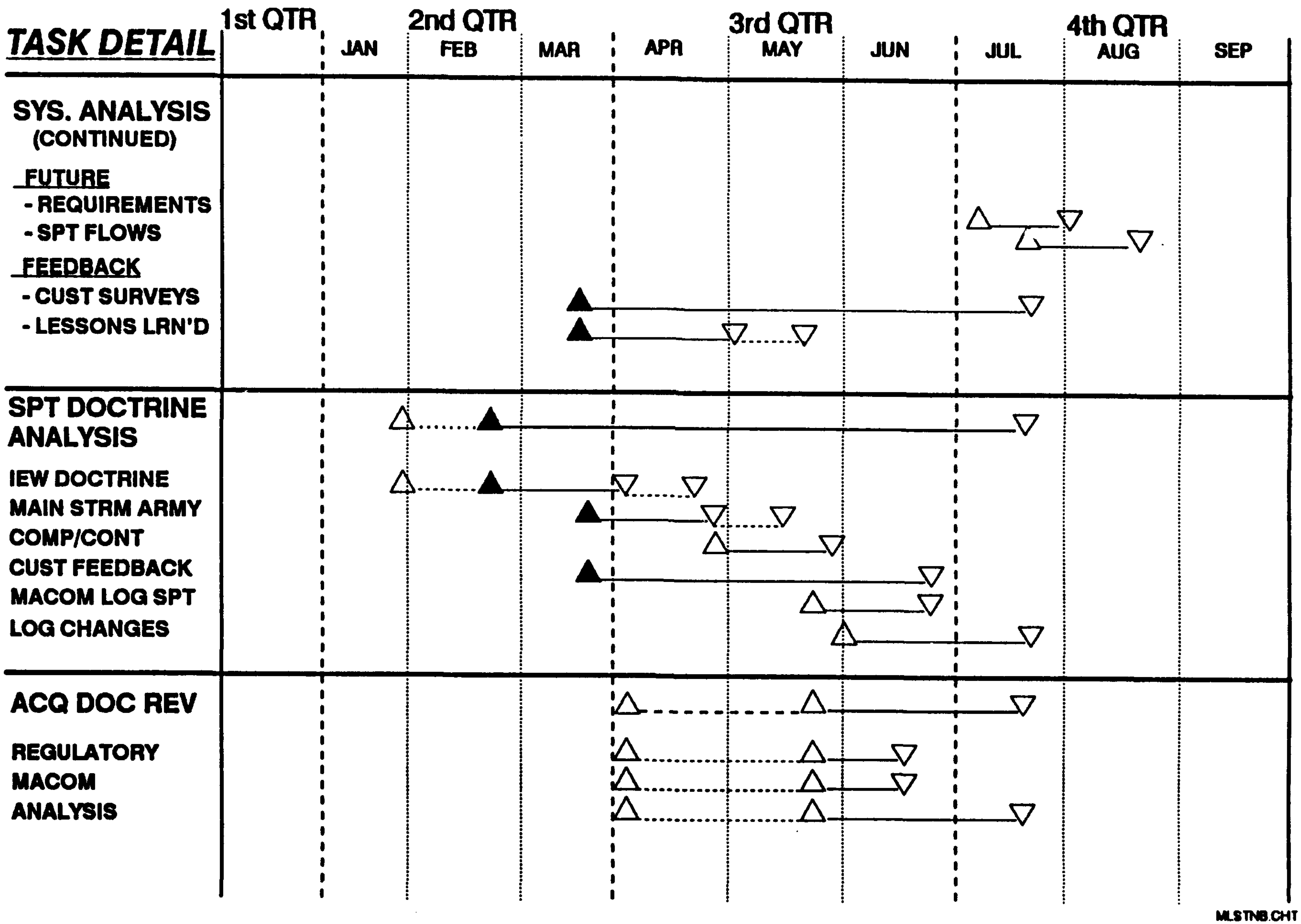
PLANNED
ACTUAL
PLANNING
DATA COLLECTION
ANALYSIS
RECOMMENDATIONS
FY 92 BATTLEFIELD SUSTAINMENT MILESTONES
MAJOR TASKS
1st QTR
2nd QTR
3rd QTR
4th QTR
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
STUDY PLAN
CONTRACT SPT
SYSTEM LEVEL ANALYSIS
SPT DOCTRINE ANALYSIS
ACQ DOC REV
TECH/TNG ANALYSIS
RESERVE SPT
(...CONSIDERED DURING SYSTEM LEVEL ANALYSIS...PER HQDA MAR IPR)
IPRs
- MACOM
- HQDA
- MACOM GO
- COUN OF COLs
- DA GO
- VCSA
(MID OCT 92)
MLSTND.CHT

FY 92 BATTLEFIELD SUSTAINMENT MILESTONES

TASK DETAIL



FY 92 BATTLEFIELD SUSTAINMENT MILESTONES



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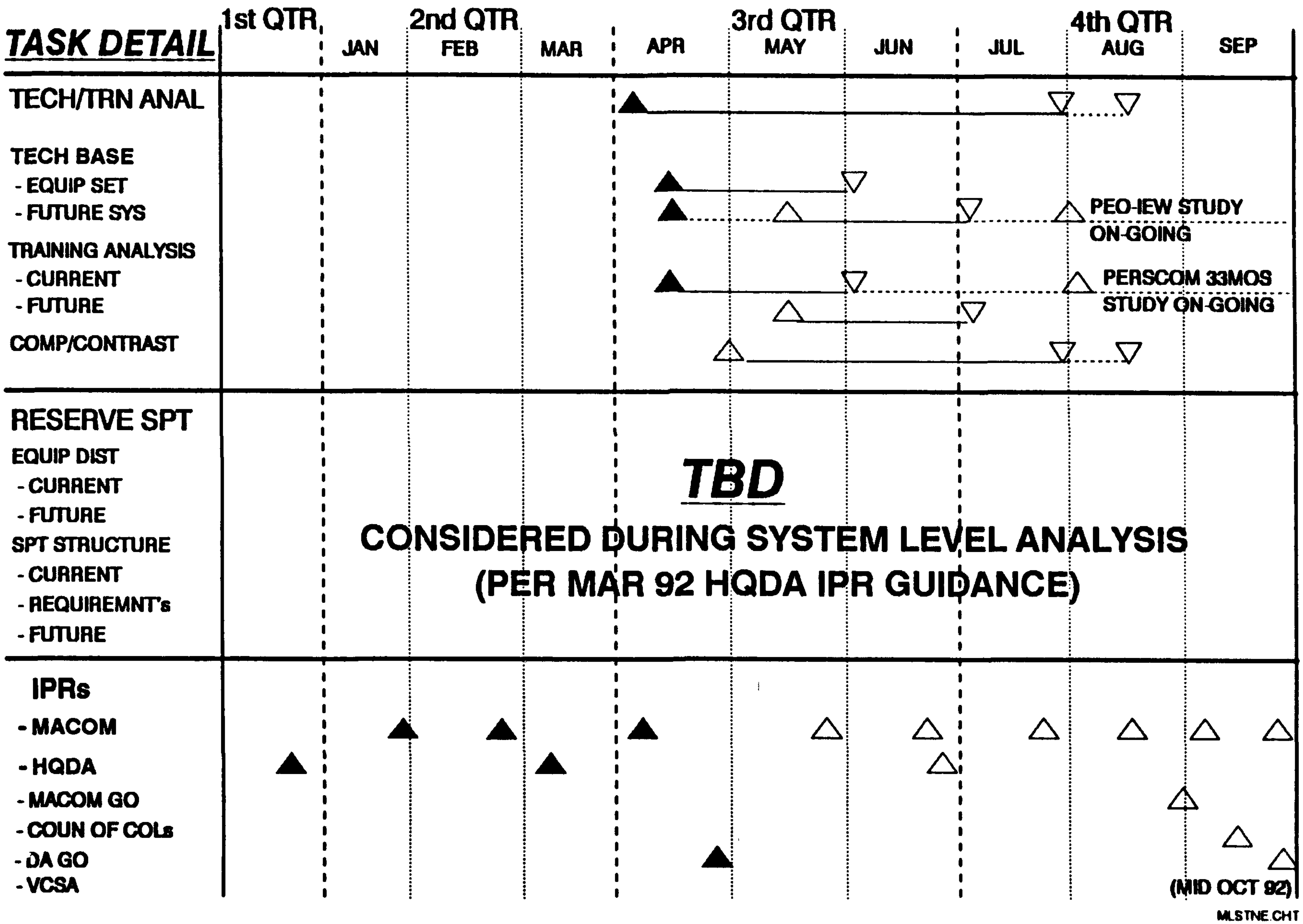


Appendix B

Designated Equipment Set

IEW Sustainment Streamlining Study
Designated Equipment Set

USER/COMMAND	EAC	ECB
INSCOM:		
AN/TRR-27A	X	
TROJAN SPIRIT	X	X
SANDCRAB	X	
SOCOM:		
SOCRATES	X	X
SSMS		X
FORSCOM:		
CEFIRM LEADER	X	
AN/PRD-11	X	X
AN/TRQ-37		X
AN/ULQ-19 V2,V3		X
AN/TSQ-164		X
AN/GRQ-27 GOLDWING	X	X
GUARDRAIL V		X
TCAC		X
J-STARS (GSM)	X	X
HAWKEYE	X	X
AN/UYK-71A*	X	X
* other users: TOPO/WEATHER		
FORSCOM/EUROPE:		
QUICKLOOK	X	X
OV1D	X	X
AN/TRQ-32		X
AN/TLQ-17A V3		X
AN/ALQ-151		X
AN/TSQ-138		X
IMPROVED GUARDRAIL		X
FORSCOM/INSCOM: [ASPO]		
THMT	X	X
EPDS	X	X
IPDS	X	X
ETUT	X	X
IES	X	X

FUTURE SYSTEMS	EAC	**USER	ECB
ADVANCED QUICKFIX		F	X
AN/PRD-12		F	X
TRACKWOLF	X	I/F	
GUARDRAIL COMMON SENSOR	X	I/F	X
UAV		F	X
IMETS		F	X
CTT	X	I/F	X
GROUNDBASE COMMON SENSOR L/H		F	X

** F = FORSCOM, I/F = INSCOM/FORSCOM

Appendix C

System Data Elements

IEW SUSTAINMENT STREAMLINING STUDY
SYSTEM DATA ELEMENTS

1. DATA REQUIREMENTS: In accordance with IEW Study Group discussions, responsible MACOMs shall provide the following information for systems identified in the Designated Equipment Set.

2. SYSTEM PROFILE:

NOMENCLATURE:
PROJECT NAME:
NSN: **LIN:** **ZLIN:**
TYPE CLASSIFICATION: **DATE:**
SECURITY CLASSIFICATION:
DEVELOPMENTAL/NDI/COTS:
SYSTEM PURPOSE:
(include Operation DS/S use)
USERS: ACTIVE ARMY____ ARMY RESERVE____ NATIONAL GUARD____
OTHER SERVICES____
PRIME MOVER:
(identify as Std/Mod/Unique)
PRIMARY POWER SOURCE:
ALTERNATE POWER SOURCE:
UNIQUE REQUIREMENTS:
(special fuels/fluids, etc.)
TRANSPORTABILITY ISSUES:
(special handling, security and hazard considerations)
COMBAT DEVELOPER:
MATERIEL DEVELOPER:
AAO:
PREDICTED RAM DATA:
PROGRAM MGMT. ORGANIZATION:
(Levels I,II,& III)
MATERIEL RELEASE DATE: **____CONDITIONAL ____FULL**
FIRST UNIT EQUIPPED:
(include Date)
FIELDING DENSITY:
QQPRI:
AQUISITION SUPPORT CONCEPT:
- MAINTENANCE CONCEPT:
- SUPPLY SUPPORT:
ASSIGNED MMCC:
SUSTAINMENT PROPONENT:
(actual)
SOFTWARE SUSTAINMENT PROPONENT:
LIFE CYCLE STATUS:
FORECAST TERMINATION DATE:
REPLACEMENT SYSTEM:

3. PHASED BASELINE DATA: The following data requirements reflect system data established during Pre-Desert Shield, Desert Shield/Storm, and Post-Desert Storm Phases of operation.

a. FIELDED (Pre-DS)

SYSTEM DENSITY:
READINESS RATE:
(w/failure data)
SUSTAINMENT PROPONENT:
SUPPORT MECHANISMS:
MAINTENANCE & SUPPLY:
REQUISITION/DISTRIBUTION/STOCK CONCEPT:
CONTRACTOR SUPPORT: ____OEM ____GENERIC
LOCATION: COST:
CONTRACT MANAGING PROPONENT:
USACIMMC SRA SUPPORT:
SUPPORT COSTS:
SECURITY HANDLING:
TRAINING EXPERTISE vs NEED:
(Institutional vs Follow-on)

b. OPERATION DS:

SYSTEM DENSITY:
READINESS RATE:
(w/failure data)
SUSTAINMENT PROPONENT:
SUPPORT MECHANISMS:

3b. PHASED BASELINE DATA (continued)

MAINTENANCE & SUPPLY:
REQUISITION/DISTRIBUTION/STOCK CONCEPT:
CONTRACTOR SUPPORT: ____OEM ____GENERIC
LOCATION: COST:
CONTRACT MANAGING PROPONENT:
*** CAPABILITY vs REQUIREMENTS:**
RAINBOW SRA SUPPORT:
SUPPORT COSTS:
SECURITY HANDLING:
TRAINING EXPERTISE vs NEED:
DISTRIBUTION METHODS:
DESERT EXPRESS:
TRANSPORTATION ISSUES:
(Intra Theater)
ADDITIONAL SUPPORT ISSUES:
* Provide comparative analysis of support mechanism capabilities and effectiveness vs actual requirements.

3. PHASED BASELINE DATA (continued)

c. POST OPERATION DS:

SYSTEM DENSITY:
READINESS RATE:
(w/failure data)
SUSTAINMENT PROPONENT:
SUPPORT MECHANISMS:
MAINTENANCE & SUPPLY:
REQUISITION/DISTRIBUTION/STOCK CONCEPT:
CONTRACTOR SUPPORT: ____OEM ____GENERIC
LOCATION: **COST:**
CONTRACT MANAGING PROPONENT:
USACIMMC SRA SUPPORT:
SUPPORT COSTS:
SECURITY HANDLING:
TRAINING EXPERTISE vs NEED:
**** ADDITIONAL SUPPORT ISSUES:**
** Including issues/data pertinent to current or anticipated drug interdiction missions.

Appendix G

USAMC Memo, 30 Apr 92, Subj: Intelligence and Electronic Warfare (IEW) Battlefield Sustainment

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY MATERIEL COMMAND
5001 EISENHOWER AVENUE, ALEXANDRIA, VA 22333 - 0001

REPLY TO
ATTENTION OF

AMCLG-SI

4 May 92

30 April 1992

MEMORANDUM THRU COMMANDER, U.S. ARMY COMMUNICATIONS - ELECTRONICS COMMAND, ATTN: AMSEL-CG, FORT MONMOUTH, NJ 07703-5000

FOR DIRECTOR, U.S. ARMY CECOM INTELLIGENCE MATERIEL MANAGEMENT CENTER, VINT HILL FARMS STATION, WARRENTON, VA 22186-5276

SUBJECT: Intelligence and Electronic Warfare (IEW) Battlefield Sustainment

1. Reference memorandum, CIMMC, SELIM-DIR, 4 Mar 92, SAB.

2. The IEW Study Plan, submitted with referenced memo, is approved.

3. HQ, AMC POC for this action is Mr. William Shelton, DSN 284-9311/9309.

4. AMC — America's Arsenal for the Brave.

FOR THE COMMANDER:

THOMAS B. ARWOOD
Major General, USA
Deputy Chief of Staff
for Logistics

Appendix H

PEO-IEW Message, 061200Z Apr 92, Subj: Preparation for the New Family of IEW Systems

UNCLASSIFIED

HQ AMC
TELECOMMUNICATION CENTER

 003785 06/1400Z
INFO: AMCCG (01) AMCDRA (01) AMCDMR (01) AMCCS (01) TCC (01)
------------------------ 07/0402Z A2 XABX (TOTAL COPIES: 005)
INFO: PERSONAL FOR (01)
------------------------ 06/1406Z A6 XOP (TOTAL COPIES: 001)
PTTUZYUW RUEOPEG0075 0971318-UUUU--RUKLDAR.
ZNR UUUUU
P 061200Z APR 92
FM PEO IEW VHFS WARRENTON VA //SFAE-IEW//
TO RUEADWD/DA WASH DC //DAMO-FDZ//
INFO RUKLDAR/CDR AMC ALEX VA //AMCCS//
RUEDBIA/CDRCECOM FT MONMOUTH NJ //AMSEL-LC//
RUCIMDA/CDR USAIC FT HUACHUCA AZ //ATSI-CG//
ZEN/CIMMMC VHFS WARRENTON VA //SELIM-DIR//
ZEN/DA WASH DC //DAMO-FDI/FDR/DALO-DM/DAMI-ZO//
BT
UNCLAS
QQQQ

WBH 7-4

PERSONAL FOR MG MCGRATH

PERSONAL FOR BG ADAMS, DIR OF REQUIREMENTS, DAMO-FD; INFO MG MCGRATH, AMC C/S; MG BALL, DIR, SUPPLY AND MAINT, ODCSLOG, DA; MR. DAVIS, ADCSINT, DA; MG MENOHER, CG USAIC; MR. SKURKA, DIR C3I READINESS CEN, CECOM; MR. SCHEUBLE, DIR CIMMC
FROM BG CAMPBELL, PEO IEW
SUBJ: PREPARATION FOR THE NEW FAMILY OF IEW SYSTEMS
A. DAMO-FDX PERSONAL FOR MSG, DTG 311931Z MAR 92, SAB.

1. RON -- I WILL PROVIDE MY FULL SUPPORT TO ENSURE THE ARMY IS PREPARED TO FIELD AND SUSTAIN THE NEW FAMILY OF IEW SYSTEMS. SINCE MOST OF THESE NEW SYSTEMS ARE MANAGED BY PEO IEW, I HAVE BEEN WORKING CLOSELY WITH TRADOC, AMC AND HQDA TO BE SURE WE DO IT RIGHT. KEY T DOING IT RIGHT IS IDENTIFICATION OF WHICH OLD SYSTEMS (BOTH STANDARD AND MACOM-ACQUIRED NDI EQUIPMENT) SHOULD RETIRE AND WHEN THAT WILL HAPPEN.

2. AS WE PROCEED WITH THE "DOCUMENTATION" ISSUE YOU DISCUSSED, I WOULD SUGGEST WE CONSIDER THE FOLLOWING:

A. IF "DOCUMENTATION" MEANS "CDRL" ITEMS, "FEWER IS BETTER". WE ALREADY PAY FAR TOO MUCH MONEY FOR TOO MANY DOCUMENTS AND DATA ITEMS. AT A LOADED COST EXCEEDING 100 DOLLARS PER PAGE, MANY DATA ITEMS HAVE BECOME UNAFFORDABLE. I HAVE BEEN WORKING CLOSELY WITH AMC TO REDUCE COSTS IN THIS AREA AND WILL CONTINUE TO PRESS VERY HARD TO ASSURE WE BUY ONLY WHAT IS TRULY NEEDED. THIS IS A MAJOR THEME IN THE ONGOING DIALOGUE THAT GENERALS CIANCIOLO AND THOMAS ARE CONDUCTING WITH THE ACQUISITION COMMUNITY.

B. IF "DOCUMENTATION" MEANS "LINE ITEMS ON THE MTOE", I AGREE WE NEED TO GET THAT STRAIGHT. BUT I WOULD URGE HQDA AND USAICS TO CONDUCT A COMPREHENSIVE REQUIREMENTS VALIDATION REVIEW BEFORE MTOE CHANGES ARE INITIATED FOR "IN LIEU OF" ITEMS. WE ALSO NEED TO DUST OFF PLANS FOR RETIREMENT OF DISPLACED SYSTEMS. AS YOU KNOW, THE "COMMON SENSOR" PLATFORMS WE ARE DEVELOPING ARE INTENDED TO REPLACE MULTIPLE "SINGLE FUNCTION" PLATFORMS. FOR EXAMPLE, THE GROUND BASED COMMON SENSOR WILL REPLACE FIVE OTHER STANDARD COLLECTION AND EW PLATFORMS FIELDED TO HEAVY DIVISIONS. WE SHOULD LOOK BEYOND THESE FIVE SYSTEMS AND DETERMINE WHETHER OTHER NDI SYSTEMS ACQUIRED BY MACOMS AS "INTERIM SOLUTIONS" SHOULD ALSO BE DISPLACED AND/OR RETIRED, ESPECIALLY IF WE DON'T HAVE THE INFRASTRUCRURE OR DOLLARS TO SUSTAIN THEM. ANOTHER EXAMPLE IS GUARDRAIL COMMON SENSOR, WHICH DISPLACES BOTH THE RVID MOHAWK AND EARLIER, LESS CAPABLE GUARDRAIL AIRCRAFT. THE MOHAWKS ARE SCHEDULED FOR RETIREMENT, BUT THE DISPOSITION OF THE OLDER GUARDRAILS HAS NOT BEEN COMPLETELY RESOLVED. SOME WILL PROBABLY GO TO RC UNITS, BUT SOME SHOULD ALSO BE CONSIDERED FOR EARLY RETIREMENT. WE ALSO NEED TO LOOK CAREFULLY AT WHAT WE WILL KEEP IN THE INVENTORY WHEN THE COMMON GROUND STATION IS FIELDED. WE NEED TO AGREE ON THE SUPPORT CONCEPT FOR LOW DENSITY ITEMS ACQUIRED VIA ACCELERATED ACQUISITION PROCEDURES WITHOUT THE NORMAL DOCUMENTATION. SOME OF THESE SYSTEMS MIGHT REMAIN IN THE FORCE STRUCTURE ALONG WITH THE COMMON GROUND STATION (E.G., THMT, MITT, FAST-I, ETC.). IN MY VIEW, IT WOULD NOT BE COST EFFECTIVE TO INVEST IN THE ARMY'S STANDARD SUSTAINMENT INFRASTRUCTURE FOR THESE VERY LOW DENSITY NDI-TYPE SYSTEMS. MY RECOMMENDED APPROACH WOULD BE TO HAVE A TWO-LEVEL MAINTENANCE CONCEPT RELYING HEAVILY ON CONTRACTOR SUPPORT AND RETIRING OR REPLACING THE SYSTEMS AS THEY BECOME TECHNOLOGICALLY OR OPERATIONALLY OBSOLETE. WHAT WE CANNOT AFFORD TO

UNCLASSIFIED

[illegible]CATION CENTER

PAGE 02 OF 02 RUEOPEG 0075 003785 06/1400Z
DO IS SUSTAIN A LARGE INVENTORY OF DIVERSE SYSTEMS, ESPECIALLY THOSE
WE WOULD LEAVE BEHIND WHEN WE GO TO WAR.
3. I LOOK FORWARD TO WORKING WITH YOU ON THIS IMPORTANT EFFORT.
REGARDS, BILL.
BT
#0075
NNNN

PERSONAL FOR MG MCGRATH

Appendix I

Stewart Associates Inc. Study Report, 17 Jun 88, Subj: Logistic Support for Low Density Systems

LOGISTIC SUPPORT

FOR

LOW DENSITY SYSTEMS

EXECUTIVE SUMMARY

MG John K. Stoner, Jr, USA (Ret)

BG William D. Lewis, USA (Ret)

P. Lawrence Bein

E. Brooks Stewart

17 June 1988

Contract DAAB07-87-C-S001

STEWART ASSOCIATES INCORPORATED • *240 Half Mile Road, Red Bank, New Jersey 07701 • (201) 530-0880*

This report is based on research conducted during January-June 1988, under contract DAAB07-87-C-S001 to the US Army Communications-Electronics Command.

The authors are grateful to the many organizations and individuals who generously contributed their time and shared their knowledge with us throughout the course of this effort. Particular thanks are owed to the officers and men of the many units we visited in the field. Our special thanks also go to the CECOM Logistic Assistance Representatives who helped make those field trips a success.

Notwithstanding the many contributions of others, the views, opinions and findings contained in this report are those of the authors and should not be construed as an official Department of the Army position, policy, or decision, unless designated by other documentation.

MG John K. Stoner, Jr., USA (Ret)
BG William D. Lewis, USA (Ret)
P. Lawrence Bein, PhD
E. Brooks Stewart

EXECUTIVE SUMMARY

A. INTRODUCTION

USACECOM and its associated PEOs and other development agencies -- the "Communications-Electronics (C/E) Community" -- manage over half of the US Army's systems. The majority of these critical C/E systems are fielded in low densities, and a number of common logistic support problems have surfaced and received high level attention in the past, including the following:

- Dependence on contractor logistic support, with potentially adverse impacts on combat supportability;
- Persistent spares shortages, despite intensive management, leading to decreases in system readiness; and
- A variety of maintenance workarounds that tailor support to individual end items, leading to local fixes rather than to Army-wide resolution.

The occurrence of such problems in a wide range of low density C/E systems has led many individuals in the community to conclude that low density may itself be the cause. In particular, there has been concern that standard logistic practices, procedures, and policies that support high density systems may not adequately meet low density system requirements.

The objective of this project was to identify shortfalls in the logistic support of a selected sample of low density systems, to determine both system-peculiar and systemic reasons for those shortfalls, and to recommend corrective and preventive actions.

As the detailed findings and recommendations will show, the following three points are key:

1. There is indeed a "low density support problem", though it is really a combination of several different factors -- low density, high diversity, low demand, high expectations, and high visibility -- which (a) complicate logistic support for low density systems and (b) magnify the impact of systemic problems on low density systems.

But "low density" is not a problem to be solved: rather it encompasses a collection of characteristics which must be fully understood and addressed in the course of system acquisition and deployment. One of the most important aspects of low density acquisition may be its tendency to amplify unit costs of design-for-supportability and ILS development, just by spreading fixed costs over fewer systems; it must be recognized early on that any gaps in design or ILS will be paid for later in the life cycle through increased support costs.

2. Gaps in design (BIT/BITE, redundancy) and ILS (tech manuals, spares, personnel qualification, training), and shortages in manpower, are being bridged by a wide range of maintenance workarounds, including dependence on non-soldier support in the field. Reliance on civilian maintenance in the field may postpone the ultimate correction of initial ILS gaps, and the resulting dependency undermines confidence in combat capability. Open-ended Contract Logistic Support is too often the unchallenged outgrowth of an interim arrangement, rather than a deliberate decision based on analysis of the associated economics and operational effectiveness in each case.

To solve these maintenance problems, the C/E Community must conduct a system-by-system review of specific ILS gaps, the cost to fill those gaps with alternative capabilities, and the remaining life-cycle payback in cost and operational effectiveness in both combat and peacetime. In some cases there may well be a role for life-cycle contractor support, but its choice must be based on rational consideration of alternatives and their impacts. Implementation of increased organic capabilities may require coordinated efforts of CECOM, TRADOC, AMC, and DA, particularly in realigning ILS elements and operator/maintainer personnel resources (quality and quantity) with system support needs.

3. Supply is intensively managed at all echelons, but materiel shortages and delays are still the most commonly cited logistic problems for low density systems. Wholesale item management is complicated by the large number of low-demand essential spares whose requirements are typically difficult to detect, forecast, and reprocure, and whose asset levels may be difficult to retain; manual override of automated processes appears to be the norm. Retail stockage is almost entirely nondemand-supported, organic PLL in the MI and Signal Battalions, little changed from initial issue; higher-echelon Supply Support Activities act mostly as requisition and turn-in agents. The sparing-to-availability ideal, together with its supporting SESAME/ERPSL/MPL processes, is not being disciplined in practice.

To solve these supply problems, CECOM should first fine-tune wholesale computer control parameters and data bases, improve its procedures for life-of-type and sole-source procurement, bring the practice of sparing-to-availability under control within the C/E Community, and fully integrate and document the spares planning, budgeting, execution, and review processes. Once these local steps are taken, supply concepts, regulations, and implementing processes should be reexamined to determine whether low density systems need special treatment in Army policy to achieve and sustain their prescribed readiness levels.

Detailed findings and recommendations appear in the body of the report and are highlighted at the end of this executive summary.

LOW DENSITY SYNDROME

FACTOR	EFFECT
LOW DENSITY	- Increases goals for end item performance - Increases unit cost of Design and ILS
X	
HIGH DIVERSITY	- Spreads requirements widely - Spreads resources thinly
X	
LOW DEMAND	- Challenges existing formulas for planning and managing (supply and maintenance) - Increases overhead of logistic resources
X	
HIGH EXPECTATIONS	- Drives readiness requirements higher, drives support closer to the user - Amplifies concern over shortfalls in support
X	
HIGH VISIBILITY	- Amplifies the impact of each outage - Makes crisis management the norm

"X" means the factors combine

B. PROBLEM SCOPE

The term "low density problem" is too narrow to describe the situation adequately. Instead it is more useful to recognize a "low density syndrome", a combination of five factors that tend to appear together in the creation or magnification of a wide range of problems, as shown on the chart opposite:

1. Low Density is a relative term and may reflect geography or organization as well as the total acquisition quantity. End item performance goals may rise as density decreases, as a result of having to "do more with less." Unit costs of design and ILS may rise, as fixed costs are spread over smaller acquisition quantities and over fewer projected life-cycle logistic actions.

2. High Diversity appears in the breadth of supply and maintenance elements associated with one or more low density end items. Its effect is to spread logistic requirements and resources more thinly across a wider range of specialized needs, each of which is likely to be called upon more rarely. On the supply side it results in an increasing range of non-demand-support spares which must be carried to maintain end item readiness. On the maintenance side it results in the need for troops to learn more specialized skills, each of which is likely to be less frequently called upon, and may result in a need for longer formal schooling and more on-the-job training.

3. Low Demand is partly a result of the previous two factors combined: as density decreases and reliability is spread over a wider range of tasks and components, the average demand for each component and task decreases. While reliability improvements are desirable, they will also intensify this low density syndrome factor.

4. High Expectations surround these expensive, sophisticated systems; they are expected to operate at very high readiness levels, commensurate with their cost and technical capabilities.

5. High Visibility is what these systems generate when their operational readiness or output fails to meet expectation. Crisis follows until the system is restored to expected levels.

Recognizing the distinct roles of these five factors is essential to resolving the problems encountered in the logistic support of low density systems.

Moreover, in most situations the team observed other factors as well, making it difficult to distinguish "low density" problems from others, even in the broader definition of the syndrome. In some of these cases the low density syndrome factors contributed as a cause; in other cases they simply magnified the impact of systemic problems. Both of these situations were properly included within the project scope, as follows:

A "low density problem" is one of two types:

1. A problem for which low system density was a significant contributing factor, or

2. A problem with particularly great impact on low density systems.

C. SYSTEM AND SITE SELECTION

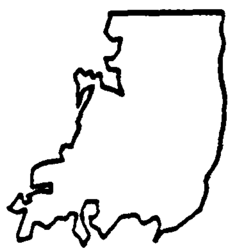
CECOM selected six low density system families for specific study:

- AN/GSC-52, State-of-the Art Medium Terminal (SAMT)
- AN/TSC-85 and TSC-93, Tactical Satellite Terminals (TACSAT)
- AN/TTC-39 and TYC-39, TRITAC Switches
- AN/MLQ-34, Tactical Jammer (TACJAM)
- AN/USD-9A, Improved Guardrail-V
- AN/ASN-86, Inertial Navigation Set

Key data concerning these six systems are found in ***Chapter III***.

Data was collected at all levels, from using units to wholesale managers to policy makers. A total of fourteen separate staff, training, support and management activities and thirty-nine Army units were visited in CONUS, Europe, and Korea. Approximately 350 soldiers, DA civilians and contract personnel were interviewed. The offices and units visited are listed below.

KOREA



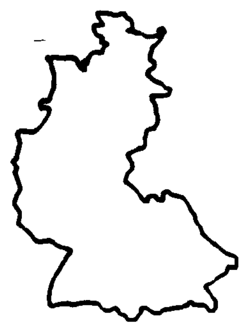
EUSA
2d Inf Div
122 Sig Bn
2d DISCOM
702 Mt Bn
19th SUPCOM
227 Mt Bn
595 Mt Co
194 Mt Bn
520 Mt Co
6th Spt Ctr
3d MI Bn (AE)
HQ USAMC FE
USAF Korea
6140 Tac Com Flt
USAISC
1st Sig Bde
304 Sig Bn
36 Sig Bn
229 Sig Co

USA

FORSCOM Units
XVIII Airborne Corps
35 Sig Bde
50 Sig Bn
35 Sig Bn
327 Sig Bn
426 Sig Bn
224 MI Bn (AE)
58 LEM Co
503 Mt Co
24 Infantry Div
124 MI Bn (CEWI)
1st Special Ops Cmd
112 Sig Bn

HQ DA
USA ODCSLOG
HQ AMC
USA IRO
HQ USA CECOM
Functional Managers
DMM, DME, DPC
DRE, PMMT, ILSO
PMs (SATCOMA, MSCS, Guardrail, SW)
EW/RSTA Center
HQ EMRA
USA TRADOC
USA Log Ctr
USA Ord Ctr & School
USA Sig Ctr & School
USA Intel Ctr & School
USAISC
Fort Meade Satellite Communications Ctr

FRG



HQ USAMC Europe
HQ 200th TAMMC
93 Sig Bde
26 Sig Bn
34 Sig Bn
51 Sig Bn
8th Inf Div
108 MI Bn (CEWI)
1st MI Bn (AE)
21 Sup Cmd
GSCP (Pirmasens)
USAISC
5th Sig Cmd
72 Sig Bn
73 Sig Bn

D. FINDINGS AND RECOMMENDATIONS

Findings appear in *Chapter IV* and recommendations in *Chapter V* of the report. The salient findings and recommendations are as follow:

FINDINGS: BIT/BITE cannot do the entire job of fault isolation. Manuals, TMDE and troubleshooting guides are still required to isolate the faulty LRU.

Redundancy is the most important contributing design factor to supportability and readiness of the systems studied.

RECOMMENDATION: Redundancy and BIT/BITE must be maintained and improved in future systems to assist in readiness and supportability. Where feasible and economical, product improve BIT/BITE on existing systems.

FINDING: The maintenance LAR is losing his capability to support the user.

RECOMMENDATION: CECOM should clearly define the maintenance LAR's responsibilities. "Routine" maintenance (AR 700-4) needs clarification. Furnish LARs with TMDE, training, and documentation appropriate to their role; and change the regulation if required.

FINDINGS: Spares demands are generally low and tend to be diffused over a wide range of components. Thus, most supply requirements are relatively more variable, unpredictable, and without pattern. This requires stockage issue and retention under readiness-oriented sparing regulations and policies.

Units need and welcome tailored support lists for their system, but desire a method for formally authorizing those lists and for influencing their update.

RECOMMENDATION: Gain control of the SESAME/ERPSL/MPL process through local initiatives of education, documentation, certification, integration, and standardization. Hold post-provisioning review, beginning with the sample systems, aimed at revising stockage levels and logistic parameters on which those levels are based. Use the system-wide results for planning factors for future low density systems, as well as for COEA of support alternatives.

FINDING: Wholesale response times for requisition fill are perceived as inadequate to support Unit readiness. Intensive management attention at all echelons is associated with backorders for both stocked and nonstocked items.

RECOMMENDATION: Implement an availability-oriented requirements objective at the wholesale level based on depot response time for requisition fill. Incorporate into SESAME and CCSS, including performance tracking.

FINDINGS: Maintenance personnel are generally under strength, with manning less than 50% overall for the systems studied; in addition, AIT has not prepared maintainers for the DS task.

RECOMMENDATIONS: (1) C/E Community should investigate why low density systems are grossly understrength. (2) Conduct additional evaluation of Signal/Intelligence School training of low density repair MOS.

FINDING: Contractor Logistic Support, whether life-cycle (CLS) or interim (ICS), is often used to fill a void that resulted from incomplete ILS planning or execution; once used, ICS tends to become entrenched as CLS by default.

RECOMMENDATION: The ILS system must be disciplined to ensure its products are compatible and supportive. Contractor Logistic Support and Interim Logistic Support must be analyzed and challenged. The provisions of AR 700-4 and AR 750-1 must be followed. COEAs are required on all systems using ICS/CLS.

FINDING: Rapid technical baseline changes (as in IGR-V), combined with low density, practically dictate Contractor Logistic Support (CLS) because such quick changes outpace the standard ILS process.

RECOMMENDATION: C/E Community should use the IGR-V and follow-on system (Common Sensor) as a test bed to evaluate the cost and operational effectiveness of prolonged and total contractor support for low density, critical mission systems in peace and war conditions.

FINDINGS: Readiness reporting is not providing CECOM and others a true picture. Reporting procedures are locally determined and subjective.

Some systems do not report on their PME, and CECOM's only channel for information is the LAR.

RECOMMENDATION: Review readiness criteria for low density systems, capture status of PME critical hardware. Minimize subjectivity in reports.

FINDINGS: Some systems are employed in a different O&O than originally planned. The support concepts have not been modified to reflect the changes and the result is a disconnect between the two. Concepts vary by theater.

RECOMMENDATION: Assess the actual employment and support concepts currently in practice. Modify support structure and resources to reflect supportability of the employment.

LOGISTIC SUPPORT FOR LOW DENSITY SYSTEMS

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I. INTRODUCTION

I. INTRODUCTION

CECOM and its associated PEOs and other development agencies -- the "Communications-Electronics (C/E) Community" -- are responsible for fielding and supporting a significant portion of Army systems and equipments. Except for tactical communications systems, net radios and individual night vision devices, these systems and equipments are characteristically fielded in low densities. Experience suggests that support of such low density systems requires intensive management at all logistic echelons, with management-by-exception being the norm. There is concern that existing logistic procedures, practices, and policies may not adequately address the special needs of low density C³I systems. Further, there is Command concern that these low density systems may have incomplete Integrated Logistic Support, and that the Army's combat capability may be degraded as a result.

This study effort was initiated under Contract DAAB07-87-C-S001 on 19 January 1988 to "examine and recommend improvements to the life cycle support provided by the C/E Community to Joint STARS and other low-density C³I systems." The systems selected by CECOM to be the focus of data analysis for the study were:

- AN/GSC-52(V), State-of-the-Art Medium Terminal (SAMT)
- AN/TSC-85 and AN/TSC-93, Tactical Satellite Systems (TACSAT)
- AN/TTC-39 and AN/TYC-39, TRITAC Switches
- AN/MLQ-34, Tactical Jammer (TACJAM)
- AN/USD-9A, Improved Guardrail V (IGR-V)
- AN/ASN-86, Inertial Navigation Set

The objective of the study was to assess the quality of logistic support for these systems, identify systemic and system-specific shortfalls, and recommend corrective actions to be initiated by the Communications-Electronics Command: CECOM and its associated Project Managers and other development agencies.

The study findings and recommendations are presented as follows:

- *Chapter II* discusses the "low-density problem" as an issue broader than just the number of end items deployed.
- *Chapter III* presents summary assessments of system-by-system support characteristics and problems, developed in the course of this effort.
- *Chapter IV* consolidates our findings across all of the low-density sample systems, and organizes them into the major topics of Contractor Support, Supply, Maintenance, and Readiness.
- *Chapter V* presents the conclusions and recommendations of this study, first overall "systemic" and then system-specific.

II. PROBLEM STATEMENT AND SCOPE

II. PROBLEM STATEMENT AND SCOPE

As noted in the preceding chapter, this effort was undertaken as a result of CECOM's concern that low density end items pose a particular set of challenges to logistic support. The Command's objective is twofold: to improve the support of the specific systems included in the sample, and to improve the support of low density systems generally.

Meeting these objectives requires a broad perspective on the issues associated with the support of the various systems in the sample. In the course of the project the team came to realize that the term "low density problem" is too narrow to describe the situation. Instead it is more properly approached as a "low density syndrome", a particular combination of five factors that tend to appear together in the creation or magnification of problems:

- Low Density
- High Diversity
- Low Demand
- High Expectations
- High Visibility

Thus, "low density" is just one aspect of the broader class of issues which characterize the systems in the sample -- and which characterize the majority of equipments and systems in the C/E Community population represented by the sample items. Recognizing the distinct nature of these five factors should help to resolve more directly some of the particular problems encountered with the logistic support of low density systems.

Moreover, in many cases the team observed a range of factors associated with particular problems, making it difficult to distinguish "low density" problems from the others, even in the broader definition of the syndrome. In some of these cases the low density syndrome factors contributed as a cause; in other cases they simply magnified the impact of systemic problems. Both of these situations were properly included within the project scope.

Thus, in the remainder of this report, the terms of reference are as follows:

- "Low density problems" are properly approached as a syndrome having five distinct though interrelated factors, and
- "Low density problems" include those for which these factors are either a contributing cause or for which these factors magnify the impact of other problems.

The rest of this chapter discusses these points in detail.

A. LOW DENSITY PROBLEMS

The development and sustainment of integrated logistic support for modern communications-electronics systems is a difficult process. Errors or gaps at any stage may have effects which last for the remainder of the system life cycle. The process is further complicated by rapid advances in technology, the changing nature of Army missions and resources, and the large amount of actions and data required to match resources to mission needs.

In this context, few observed "problems" are likely to have a single "cause" identifiable. Rather, most support problems have a number of contributing factors, often interrelated, and the cause-effect relationship is generally blurred. Thus, we adopted the following broader definition:

> **A low density problem is one of two types:**
>
> **1. A problem for which low system density was a significant contributing factor, or**
>
> **2. A problem with particularly great impact on low density systems.**

A problem is thereby considered as "low density" on the basis of either its cause (type #1) or its effect (type #2).

An example that illustrates both of the "low density problem" types is found in retail spares provisioning. With a high enough forecast demand rate, an essential spare will be automatically included in the initial issue to Intermediate and Unit levels to support a new system deployment. Conversely, if the forecast demand rate is low enough, an essential spare may no longer be included in ASL/PLL provisioning unless special action is taken. This is a case in which low density is clearly a major contributing factor, because the number of demand-supported ASL/PLL stockage lines drops steadily as the density is decreased. However, it is not the only factor in the example: for instance, the same shortfall in demand-support provisioning will arise in a high-density end item whose individual component reliabilities are extremely high. Still, under the terms of the first definition, it is clearly a valid low density problem case.

However, in every weapon system, regardless of deployment density, there are some components which fail so rarely that they will not be stocked as ASL/PLL, and this result was not seen historically as a problem. However, as newer end items were fielded in significantly lower density, individual component forecast demand rates all dropped so low that none of the essential spares was included in retail provisioning, and materiel readiness rates of these new weapon systems were predicted to fall below acceptable levels. This result led to the Army's development of the SESAME approach to low density system provisioning, which goes beyond pure demand-driven inventory control into the consideration of weapon system readiness as a necessary objective. Thus, this example is also a case in which the problem, while perhaps common to all systems, has a particularly serious impact on low density systems. As noted,

essentially every high-density end item has some maintenance-significant parts whose usage rates are low enough that they needn't be stocked below the depot level, and so occasionally a repair action will have to wait for receipt of a nonstocked spare. But for a low density end item it is more likely that all components have this characteristic, and so every repair action would encounter such added delays unless different stockage rules were applied. Thus, it is also a valid case of the second type of low density problem.

As will be evident in subsequent chapters, the second type of problem was seen more commonly than the first type in this study.

So far the discussion has focused on the form of the low density problem; in one type the low system density impacts the problem, and in the other type the problem impacts the low density system. The example also suggests that the substance of the problem may extend beyond low density *per se*; that is, the problem arises from a combination of a low density end item using high reliability component parts which are not already in the Army inventory. In the next section of this chapter we consider the possibility that these factors are related.

B. THE LOW DENSITY SYNDROME

One significant observation made in the course of this investigation is that a particular combination of five factors tend to appear together in association with the low density systems studied:

- Low Density
- High Diversity
- Low Demand
- High Expectations
- High Visibility

Since they tend to occur together in both the generation and impact of a wide range of problems, we consider them a low density syndrome.

Table II-1 summarizes the salient aspects of each of the factors. Since they interact in a way which multiplies the effects, the table shows "X" between the factors.

The following paragraphs amplify the summary observations in the table.

B.1 Low Density

Low density by itself is probably the most subtle factor in the syndrome: its influence is generally indirect, its effects are difficult to quantify, and so it rarely appears as a major problem source without one of the other factors being present as well. In subsequent sections we shall describe how low density combines with the other factors in the syndrome, but first it is useful to address low density as an independent factor.

TABLE II-1 THE LOW DENSITY SYNDROME

FACTOR	EFFECT
LOW DENSITY	- Increases goals for end item performance - Increases unit cost of Design and ILS
X	
HIGH DIVERSITY	- Spreads requirements widely - Spreads resources thinly
X	
LOW DEMAND	- Challenges existing formulas for planning and managing (supply and maintenance) - Increases overhead of logistic resources
X	
HIGH EXPECTATIONS	- Drives readiness requirements higher, drives support closer to the user - Amplifies concern over shortfalls in support
X	
HIGH VISIBILITY	- Amplifies the impact of each outage - Makes crisis management the norm

What is a "low density" system? Numerically the term is only relative: some end items are acquired and fielded in lower densities than others. In the extreme cases there is certainly no question: Improved Guardrail-V, with a worldwide density of two, is inarguably a low density system; while the AN/PVS-5A Night Vision Goggle, deployed in the scores of thousands, is a high-density system. However, there is no density breakpoint below which a system is "low density" and above which it is not; any attempt to make such a clear-cut distinction would be arbitrary and of questionable benefit.

Furthermore, "low density" may be a relative term organizationally or geographically; *e.g.*, a particular high-density end item may be deployed in low density only to Special Operations units or only to units in Alaska.

The impact of low density may be felt in several ways. First, low density acquisition tends to increase the performance demanded of each end item deployed; that is, the new system is asked to take on more tasks, perhaps increasing the complexity of the system in the process. Such increases in complexity may have significant impacts on both reliability and maintainability.

Secondly, low-quantity acquisition and deployment tend to increase unit system and support costs as a result of learning-curve effects, economies of scale, and the allocation of fixed costs among fewer systems. In such cases, life-cycle cost and other economic considerations may argue for less extensive acquisition of organic ILS capability; similarly, the trade-off of acquisition and logistic cost in such cases may limit the degree to which supportability is allowed to influence design. From a purely economic standpoint such decisions may be entirely appropriate in specific low density cases, but it is nonetheless crucial to ensure that both economics and operational effectiveness are included explicitly in the decision.

Finally, low density by itself may decrease operational flexibility by increasing the specialization of support resources. For example, a system deployed in peacetime only in one theater, and heavily dependent on specialized IGS maintenance available only in that theater, is limited in its ability to deploy and maintain operational efficiency in a different theater.

B.2 High Diversity

We use the term "diversity" to indicate the breadth of supply and maintenance elements associated with one or more end items. For example, an end item with a thousand different components removed at the field level has a significantly higher diversity of supply requirements than an end item having only twenty such components. Similarly, a system having a thousand different field-level maintenance tasks described in its technical documentation has a substantially greater diversity of maintenance requirements than a system having only fifty such tasks documented.

Diversity is also increased when an end item introduces new supply or maintenance requirements, rather than using common existing elements. For example, introducing a new end item with all new componentry, or one requiring mostly new and specialized maintenance skills, increases diversity.

The effect of high diversity is to spread logistic requirements and resources more thinly across a wider range of specialized needs, each of which is likely to be called upon more rarely. On the supply side this effect results in an increasing range of non-demand-support ASL/PLL lines which must be carried to maintain end item readiness. On the maintenance side it results in the need for troops to learn more specialized skills, each of which is likely to be less frequently applied, and may result in a need for longer formal schooling and more on-the-job training.

The problem of diversity begins early in ILS development. Manpower required to develop and review tech manuals and provisioning data is independent of system density, and more closely driven by the diversity factor; namely, the number of maintenance tasks and provisioning lines. If these elements were common to existing equipments, much of the ILS process would be simplified: automated cataloging, use of existing tech manuals, incremental procurement and distribution of existing inventory spares, and use of existing maintenance skills and instruction courses. Without such commonality, the cost of ILS development increases, along with the chances for error; and with the acquisition and deployment of more end items in lower densities, fewer human resources tend to be dedicated to the ILS process for any one system.

The more diversity is present, the more difficult is it to gain experience. For example, the wide range of components and maintenance tasks in a complex low density system may result in few repetitive requirements and more one-time events; this can greatly complicate the process of training and provisioning.

The problem of diversity continues throughout the life cycle and may have a compound effect on low system density. For example, the more specialized low density systems that are included in the responsibilities of a given maintenance MOS, the less qualified he will likely be to support any one of them; this is the case seen with the 33T used in field maintenance of IEW equipments. As another example, the 29M maintainer of low density TACSAT systems is also the MOS required for many higher-density systems; with personnel shortages against authorization, these 29Ms are more likely to be located in areas of high-density system concentration, not at remote locations where some of the TACSAT systems are deployed.

One additional result of low density and high diversity interacting is the reduction of demand, which is the subject of the next paragraph.

B.3 Low Demand

As the density of end items drops, and as the equipment reliability is spread over a wider range of diverse components and maintenance tasks, the average demand for each component and task decreases. This uniform drop in demand has both one-time and life-cycle impacts.

A one-time impact was already noted (the example of *Paragraph A*) in the area of provisioning, where the rules and models were changed to accommodate the uniformly low spares demands of low density systems. But while the new approach solves the mathematical problem, there is still a need for more intensive human involvement in the practical process to ensure that the right spares are selected for analysis, that the input data are carefully screened, and that results are verified and properly implemented.

Since many of the Army's automated logistic processes are geared to supporting high-demand requirements, life-cycle impacts are seen as an increased level of human management and manual intervention. For example, both wholesale and retail supply computers require special review and override actions be taken periodically to keep stockage levels of low-demand spares from being dropped.

In the course of the survey in this effort, sustained intensive spares management was one of the most common "low density problems" identified by those interviewed. However, we now recognize it as a low-demand problem within the low density syndrome. What makes it associated particularly with low density systems is that low-demand spares are the rule, rather than the exception, for low density systems.

Analogous low-demand impacts can be found in the area of maintenance as well, but here a more appropriate term is "low frequency": the lower the frequency of an individual repair action, the more economically attractive it becomes either to discard the item or to have a contractor repair it, rather than to acquire an organic repair capability, since the up-front ILS costs are spread over fewer projected repair actions. Nonetheless, in such cases it is just as important to consider the operational factors as it is the economic ones, to ensure that combat capabilities are retained.

Moreover, a low frequency of maintenance may combine with a high diversity of repair tasks to produce compound effects. For example, the result may be a loss of maintenance personnel skill levels, greater reliance on BIT/BITE and technical manuals for troubleshooting, and a reduction in opportunities for batch processing of repairs.

B.4 High Expectations

Earlier (*Paragraph B.1*) we indicated that low system density may result in increased pressure on operational performance. In addition, part of the syndrome is to increase expectations on logistic performance, particularly on materiel readiness (such as operational availability). One example is found in the GSC-52 satellite terminal which, as part of the Defense Satellite Communications System, is tasked to a readiness level of 99.5 percent. Not only are low density systems being tasked to fail less often, they are also being required back on the air more rapidly once they do fail.

Such increases in readiness objectives are translated into intensive support resources being placed closer to the end item. For the GSC-52 this results in intensive on-site maintenance and supply dedicated to keeping the terminal operational, in addition to extensive built-in redundancy in the end item itself.

It is not only strategic systems which are affected by heightened expectations of readiness. The Improved Guardrail-V system, with only one system deployed to each corps in USAREUR, is a case where 100 percent of an important tactical asset is lost to the corps every time the system goes down. At all of the Guardrail sites, the objective of rapid system restoration results in a highly visible on-site contractor involvement in maintenance.

B.5 High Visibility

The other side of the coin from high expectations is the high visibility which attends shortfalls in meeting those expectations. This final element of the low density syndrome combines with all of the others to magnify the perception of problems, as well as to add to those problems.

The combination of high diversity and high visibility may increase the tendency towards crisis management, with the result that some logistic problems will be cyclical. With so many logistic elements needing concentrated attention, there is great pressure to intensively manage a problem until it is partially resolved, then go on to the next problem. Without an in-depth fix, unresolved problems will probably recur sometime in the future, cycling the process of crisis management for the same problems all over again.

The same low density system characteristics which make ILS development difficult or expensive or error-prone to begin with are the same factors which make permanent correction just as difficult, expensive, or prone to repeated error. Attention paid to keeping the ILS current for a few high-density, common, high-demand supply and maintenance elements seems to pay off more handsomely on the investment of time and resources than doing the same for many low density, unique, low-demand elements.

C. SUMMARY: PROBLEM SCOPE

It would be inaccurate, and an oversimplification, to attempt to correlate the issues associated with logistic support of weapon systems solely to the fact that they are deployed in low density. Low density does manifest itself by making an ILS deficiency more evident by exacerbating its effects; low density can also contribute to the creation of such an ILS deficiency. But density itself is rarely the dominant issue in these cases.

On the other hand, there are broader characteristics of low density SIGINT/EW systems that bear heavily on the low density syndrome. These characteristics must be recognized when managing ILS for low density systems:

- High Diversity -- large numbers of system/component types, but in individually low population;
- Low Demand -- the population simply doesn't generate a large volume or frequency of demands on support resources;
- High Expectations -- the systems are key to modern battle management and "They Must Work!"; and
- High Visibility -- if one system isn't working, everybody knows it.

Collectively, all of these characteristics form the scope of logistic support problems addressed in this report.

III. SYSTEM ASSESSMENT

III. SYSTEM ASSESSMENT

This chapter presents the Study Team's assessment of the data and information collected during site visits and other interviews held during February through April 1988. It is organized into five major sections; the first four sections present the overall and general assessment of the issues in the following four categories:

- Design for Supportability,
- Maintenance,
- Supply, and
- Readiness.

In the final section of the chapter *(III.E System Summaries)* the same four subject categories are addressed for each of the sample systems in turn:

AN/GSC-52	....	State-of-the-Art Medium Terminal (SAMT)
AN/TSC-85 and AN/TSC-93	.....	Tactical Satellite Systems (TACSAT)
AN/TTC-39 and TYC-39	....	TRITAC Switches
AN/MLQ-34	....	Tactical Jammer (TACJAM)
AN/USD-9A	....	Improved Guardrail V
AN/ASN-86	....	Inertial Navigation Set

Detailed data on which these assessments are based is contained in separate Annexes.

A. DESIGN FOR SUPPORTABILITY

The objective of Integrated Logistic Support is to obtain reliable, maintainable, transportable and supportable materiel at the least cost of ownership, by integrating logistic support considerations into the system and detail design effort. Design for Supportability is the goal: RAM, Built-In-Test and redundancy are among its principal design objectives.

Throughout the conduct of this study, two of these parameters surfaced continually in discussion:

- Redundancy and its contribution as a supply/maintenance buffer; and
- BIT/BITE and its utility/effectiveness in troubleshooting.

Each of these is discussed in the following paragraphs.

A.1 Redundancy

For the systems in the study, redundancy is one of the most significant design characteristics contributing to system reliability and supportability. This feature contributes directly to the system readiness posture in two ways:

- Automatic switch-over of standby modules allows a system to remain up for some time following failure of redundant subsystems, thereby eliminating the need for immediate restoration of a module failure;
- Additional backup subsystems may allow subsequent maintenance or supply actions to be postponed even longer without taking the system down, thereby alleviating the impact of shortages in logistic resources.

The benefits of redundancy are seen in the GSC-52 satellite terminal, whose estimated three-times backup redundancy allows it to achieve over 99 percent target availability while relying only on green-suit support below the depot level. At the other extreme, the ASN-86 has no redundancy and relies on an on-site contractor to repair single-thread LRUs rapidly, in the face of worldwide shortages of replenishment spare LRUs. In the middle appear the TACSAT systems: the TSC-85 is described as a "TSC-93 with redundancy" and sometimes serves in practice as a source of spare LRUs to keep TSC-93s up and running.

A.2 BIT/BITE

Another important design-for-supportability factors is the performance and contribution of BIT/BITE to maintenance and readiness. BIT/BITE is not a critical constraint on maintenance for the sample systems: this is not to say that BIT/BITE in each of the systems is good, rather that maintenance personnel have found effective workarounds in cases where BIT/BITE is incomplete .

Generally, BIT/BITE will isolate to the first tier of system architecture (such as a processor, receiver, modem, or converter), but for the requisite level of maintenance, this capability is insufficient. Where second tier BIT/BITE (to a module or group of PCBs, for example) does exist, the task still remains to isolate to a single fault.

In some cases (such as the TTC/TYC-39) the contractor brings proprietary test aids and/or equipment to the bench or to the system to isolate to a single replaceable element. Where this aid does not exist, maintenance personnel must isolate to the single replaceable fault by "board swapping", using good boards taken from the PLL, or from a redundant rack (*e.g.*, TSC-85A), or from another system (*e.g.*, IGR-V, both airborne and ground elements).

Since BIT/BITE is a system design parameter, no easy fix is possible for the fielded systems evaluated. For the future, however, BIT/BITE design should be driven by at least three parameters:

- Cost,
- Advancing technology, and
- Correlation to the maintenance concept.

The requirement for workarounds should be minimized.

The most notable impact of the combination of BIT/BITE gaps, contractor involvement, and board-swapping procedures is a reduction of Army capability, causing numerous workarounds including the use of contractors to perform or assist in the maintenance function forward of the Corps rear boundary. BIT/BITE and TMDE deficiencies increase the role the contractor plays in finding workarounds and providing proprietary TMDE. Either way the within-the-battalion contractor presence continues to grow, catalyzed by BIT/BITE workarounds, inadequate MOS training for IDS, and tech manual deficiencies.

B. MAINTENANCE

This assessment of maintenance activity for the sample systems reveals a wide range in the characteristics of correlation between the Army's levels of maintenance and the performance of maintenance, as well as some common threads:

- In the case of the GSC-52 terminal, the on-site soldier-performed maintenance is self-contained and highly successful. Contractor logistic support (CLS) involvement on-site is minimal, and the general maintenance environment is judged as good. There are, however, problems with the GSC-52 which seem to be common throughout all the systems studied:

  -- AIT leaves the unit with an extensive OJT task; and

  -- There are shortfalls in the completeness of fielding: TMDE shortages, initial issue PLL shortages, and inadequate draft TMs.

- In the case of IGR-V, on the other hand, the maintenance environment is permeated by workarounds, a complete interweaving of soldier maintainers, contractor and SAAD personnel, indistinct delineation of maintenance levels, and an overall situation best described as unable to go-to-war. As with the other sample systems, there are certain common characteristics:

  -- AIT shortfall leaves a heavy OJT burden on the unit, that falls mainly on contractors, depot personnel, and sometimes the CECOM LAR;

  -- There are continuing military personnel shortages against authorization, both in quantity and in requisite MOS; and

  -- There are continuing shortages in the completeness of fielding that lead to workarounds -- initial provisioning a hodgepodge of absent and unfilled lines; systems put in place with voids in mission-critical equipment, resulting in a continuous game of box swapping; and deficiencies in fault diagnosis capability.

In addition to this wide range of contrasting on-site conditions found in the field assessment, it has been determined that the Army's maintenance policy -- *AR 750-1 Army Materiel Maintenance Policies* -- also contributes to an inconsistent maintenance posture:

- *Paragraph 2-1(f)* of *AR 750-1* prescribes that "...repair will be minimized at lower levels of maintenance by prioritizing the concept of discard at failure ...." Not only is this policy severely out of step with the realities of system design in our sample systems, but much of the maintenance effort exerted in the support system is focused on repair and return because of deficiencies in the provisioning pipeline.

- *Paragraph 2-3(b)* is self-defeating of any goal to instill organizational and doctrinal discipline in the maintenance system. On the one hand it defines the MAC as the primary tool for assigning tasks to maintenance levels. On the other hand it states that user experience will be used to temper mathematically computed placement of tasks on the MAC. This paragraph is a license for maintenance anarchy.

- *Paragraph 2-5(b)*, in similar fashion, authorizes commanders to compromise the discipline of three-level maintenance by authorizing "...the supported unit or IDS activity to perform the next higher level of maintenance...."

Thus, not only do shortfalls in TMDE, repair parts, tech manuals, and training contribute to an undisciplined support system, but the Army's policies appear to foster it.

In summary, four significant characteristics of the maintenance process for the sample systems have been observed:

- In the press to maintain system readiness, there is a disregard for correlating the maintenance allocation to existing levels of maintenance, brought on by deficiencies in BIT/BITE, tech manuals, and TMDE, and fostered by the closeness of the contract logistic support working relationship to these systems' support structures;

- The general correlation between maintenance concepts on the one hand and organizational and operational concepts on the other is low, raising into question the go-to-war readiness of the sample systems;

- With one notable unit exception, there was no obvious maintenance workload burden found in the sample systems -- the units attributed all downed equipment to supply problems, not maintenance; and

- Significant personnel deficiencies exist, both in actuals against authorizations and in adequacy of AIT, manifested by extensive requirements for OJT, much of it supported by CLS contractors. In Korea, while personnel strengths are generally at or above authorizations, a bigger issue appears in the area of training, where the short tour and high turnover of personnel greatly exacerbate the problem.

C. SUPPLY

Spares supply, including initial issue and replenishment, was cited by using units as a major problem with system supportability: in Korea, it was consistently cited as <u>the</u> biggest problem. Requisition and turn-in problems were cited along with those of parts availability.

The supply posture for the sample systems at retail and wholesale levels generally parallels the maintenance posture for those systems, and covers as wide a range. Continuing the contrasting examples which began ***Section III.B***:

- The GSC-52 terminal site is self-contained in spares supply as well as in maintenance capability. Initial provisioning efforts attempted to spare on-site essentially every LRU which the MAC authorizes for on-site removal/replacement. Spares which are not available on-site, whether non-stocked or out-of-stock, must be supplied from the whole-

sale level rather than from the AMSF, though the AMSF acts as the requisition/turn-in agent for the satellite station.

- In the case of the IGR-V, the supply posture is also characterized by a variety of workarounds, with many opportunities for gaps in coverage and much intensive management applied. Initial provisioning was lean, in the sense that spares buy quantities were mostly three each -- one for each of the two end-item sites, plus one for the wholesale level. Some replenishment is effected through normal channels (the requisition and turn-in process), but a significant volume of resupply occurs off-line in the repair-and-return program managed by Sacramento Army Depot.

In all cases, on-site stockage is dominated by non-demand-supported PLL, whose contents have changed little since initial provisioning. Units expressed a continuing theme of inadequate range and depth, and lack of control of the spares needed on site.

A number of common characteristics were found in the course of the study:

- Despite PM and wholesale-level concern that add/retain criteria are not met for these low-demand items, most units have been keeping asset levels at or above initial issue levels for several years at least, with no apparent oversight from higher echelons. Failure to add items perceived as critical stems more from a feeling of futility than from any overt higher-echelon denial of action.
- In most cases, each using unit is essentially the sole stock point for spares used in its maintenance activities. Such spares may be called "PLL", "ASL", "ASL/PLL", "Bench Stock", or "Shop Stock" by individual units. Higher SSAs provide mostly pass-through requisition and turn-in services, rather than any DX or umbrella ASL stockage.
- Where Intermediate-echelon supplies are found above the unit level, they are normally associated with IGS-level repair (including DOL). In some cases they are connected with (interim) contractor repair activities, such as for the MLQ-34 at Pirmasens; in other cases they are connected to an SRA repair (and DX) program.
- None of the sample systems was fielded with an authorized ERPSL or MPL; only one of the systems (TACSAT) is currently approved for ERPSL.
- SSAs periodically update their information regarding unit-level stocks as represented in their computers (DS4, SARSS, *etc.*); it is the unit's responsibility to indicate add/delete PLL lines, but the SSA's duty to add/delete ASL lines. Thus, for example, SSA for the 50th Signal Bn (Fort Bragg) prints out many of the 50th PLL lines, but nearly all of them are shown as "nonstocked" to the ASL.

D. READINESS

In most of the low density systems in the sample, either one of two readiness reporting characteristics was found:

- Readiness of the system is not reported, or
- Reported readiness is highly subjective.

Considering the importance of the systems in this study to the Army's mission, this general condition of loosely defined and applied readiness criteria is surprising.

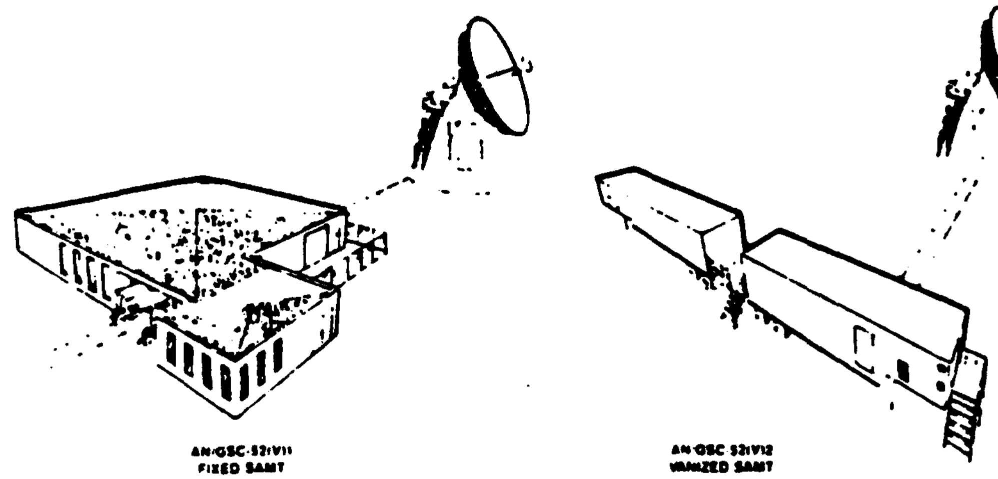
The result of this situation is twofold:

- The absence of formal readiness reporting removes the high-level Army-wide visibility which may be needed to correct both acute and chronic support problems; and
- The credibility of what reporting exists may be undermined by its subjective basis.

Further details of this assessment, and its implications, are contained in *Chapter IV*. In summary, the following points are noted in assessment of readiness:

- Readiness of the several low density systems sampled is subjectively defined, loosely applied, and unreported;
- Redundancy plays a significant role in maintaining readiness;
- BIT/BITE of most systems sampled offers only partial identification of system status, and may not always be credible;
- Go-to-war sustaining capability is seriously compromised by dependence on the levels and nature of peacetime resources.

AN/GSC-52(V)
SAMT



AN/GSC-52(V)1
FIXED SAMT

AN/GSC-52(V)2
VANIZED SAMT

The AN/GSC-52(V) is a strategic, high capacity, State-of-the-Art Medium Satellite Communications Terminal (SAMT) operating in DSCS, NATO, and similar satellite networks. Procured as NDI system for a total of 39, of which 16 will be operated by USAISC. The balance of systems are for other services and special users.

Significant data:

Unit Cost:	$5 Million
MTBF:	1000 hours
MTTR:	60 minutes maximum
PLL/ASL:	261 lines
No. Provision Lines:	13,026 (no depot-level yet)
Opr/ICS/IGS Repairman:	29Y (15 per site)

E. SYSTEM SUMMARIES

Assessment of each sample low density system is summarized in the following subsections. The facing page at the start of each discussion highlights the individual system characteristics.

E.1 GSC-52 Medium Satellite Terminal

E.1(a) Design for Supportability

This is the only system in the study having continuous positive system-subsystem status monitoring: a single display indicates real-time status of all major subsystems. BIT/BITE is centralized in an on-screen display of status, isolating approximately 75 percent of failures to a single LRU; while good compared to other systems, this is below the design goal of 90 percent. BIT ambiguities are covered to a degree by TMDE and by the use of cumbersome troubleshooting narratives in draft technical manuals. Some diagnostic software updates are imminent. TAG manuals are to be released in December 1989.

Substantial redundancy (roughly three-times) keeps the terminals relatively insensitive to failure of critical LRUs, automatically routing around problems and allowing on-equipment repair without taking the entire system down. This redundancy also provides significant buffer against delays in resupply.

E.1(b) Maintenance

The GSC-52 is generally perceived to be a maintenance success story. Soldier maintainers are good. Currently, the influence of NET is very evident. How the quality of soldier maintenance will be sustained through several iterations of OJT is not yet clear. There is an estimated 25% ambiguity in BIT/BITE to the LRU; current documentation to cover the gap is acknowledged to need improvement, and it is understood that this action is under way. There is concern at one site that power differences between the antenna control room and the ground control facility result in BIT/BITE discontinuities for a given fault as indicated at the two locations. Documentation in general is viewed as too cumbersome to be totally effective; for example, six different manuals are required to work on a transmitter at either DS or GS levels.

Maintenance through GS is authorized on site, although from an on-equipment perspective the distinction is not meaningful, because MOS 29Y performs all three levels. This also places a premium on the need for GS-related TMDE, because BIT/BITE augmentation with TMDE becomes the standard operating procedure. At initial fielding, TMDE shortages existed, and MTDA actions were required to obtain TMDE authorization at certain sites.

At the bottom line, maintenance performance should be rated high for this system. The principal maintenance-related issue is that the integration of maintenance concept, TMDE requirements, documentation structure, and BIT/BITE capabilities was deficient, requiring on-site solutions to the disconnect that resulted.

E.1(c) Supply

There are roughly 2,850 NSNs in the GSC-52 authorized for field-level removal/replacement (DEPLOY data). Field stockage of these NSNs is entirely on-site PLL, with provisioning limited to only 261 NSNs. One of the two sites visited has never increased PLL above initial authorizations, while the other added 96 lines.

At the wholesale level there are 588 CECOM-managed NSNs, of which 575 are stocked; however, most of these stocked lines had to be manually frozen as such, in order to override CCSS decision criteria. Still, more than half of the "stocked" NSNs have no on-hand serviceable wholesale assets (23 March 1988), and a fifth of the NSNs have outstanding backorders. Given the commonality between the GSC-52 and other terminals, it was not possible to determine the extent of backorders affecting GSC-52s; however, sites we visited indicated continuing shortage of initial fill, ranging from seven to nine percent of initial-issue NSNs.

Both PLL and wholesale pipeline requirements were established manually off-line, rather than using either CCSS or SESAME calculations; though SESAME was run, its results were disbelieved and discarded. At this point 31 terminals have been accepted by the Army, but only 15 systems have been fielded; the difference of 16 has served to provide a significant pool of spares from which replenishment requisitions from activated users can be satisfied. Whether initial issue requirements to field the remaining 16 systems, and whether the fully deployed fleet can be sustained thereafter, are open questions. The present spares cushion may be masking resupply problems seen in other low density end items.

Replenishment requisitions appear to be following standard supply procedures, as are turn-ins. The AMSFs act only as pass-through agents for user sites, not as supply points; this will change as selected repair tasks are assigned to AMSF in the future.

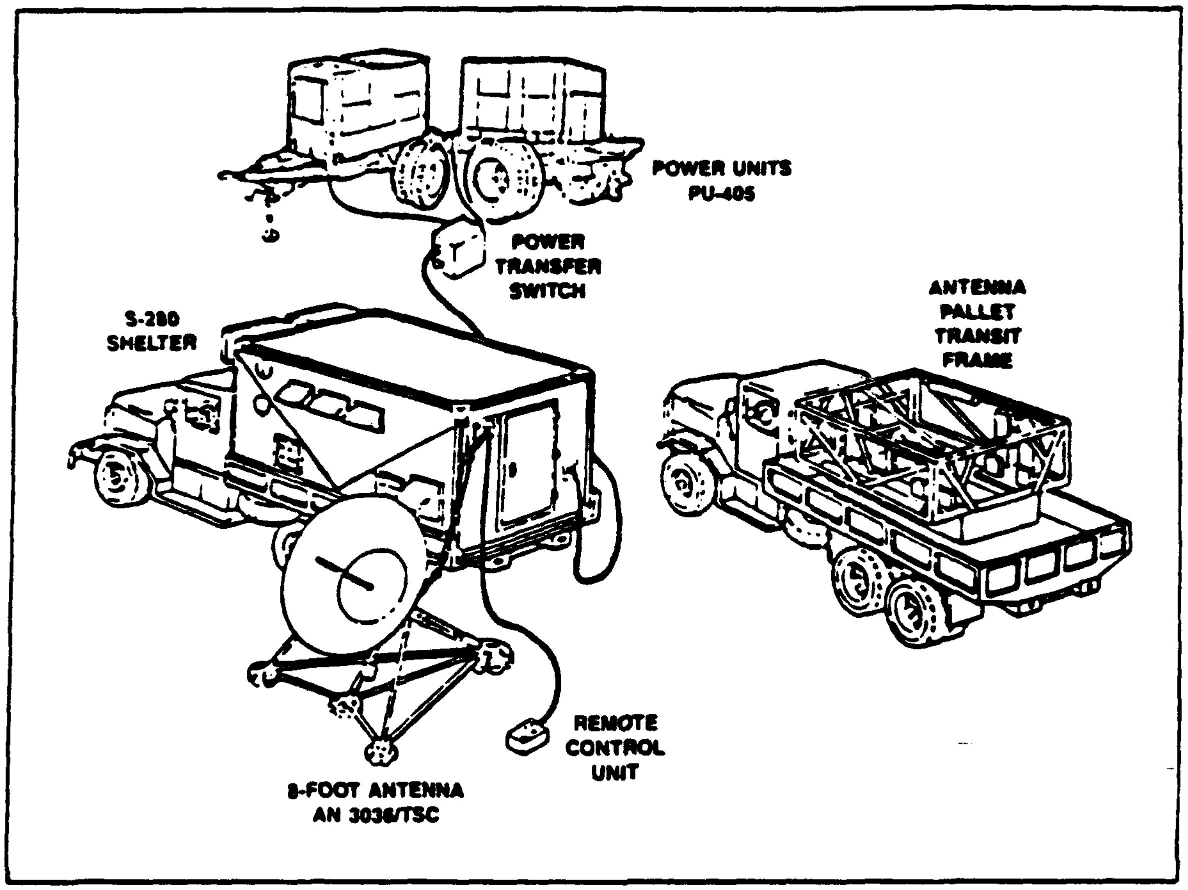
At the bottom line, supply support for the GSC-52 is assessed to be the best of all the sample systems. Our concerns are not with present performance, but with the potential for future problems; in particular,

- How many of the nonstocked and zero-balance NSNs may be requisitioned.
- How long it may take to procure them, and
- How many of today's positive-balance NSNs might go to zero-balance as the balance of acquired systems are deployed.

E.1(d) Readiness

As a strategic system, readiness of this satellite terminal is not reported or tracked. While any terminal downtime is reported to USAISC and DCA, and such events receive high visibility, no information on readiness status or trends is available.

AN/TSC-85A & AN/TSC-93A
TACSAT



The Tactical Satellite System (TACSAT) consists of the AN/TSC-85A and the AN/TSC-93A satellite terminals, together with their associated prime movers and power generators. These systems are fielded in varying numbers depending on the operational concept of the gaining unit. The TSC-85 is the "Hub" Terminal and the TSC-93 the "spokes": One TSC-85 can operate with up to four TSC-93s. The system operates in the SHF Band with a maximum capacity of 96 channels.

Significant data:

Unit Cost:	TSC-85 $900 Thousand; TSC-93 $600 Thousand
MTBF:	TSC-85 250 hours; TSC-93 240 hours (both specification values)
MTTR:	20 Minutes at ORG (specification)
PLL/ASL:	95-150 lines
No. Provision Lines:	27,790
Operator-Maintainer:	31Q
IDS/IGS Repairman:	29M

E.2 TSC-85 and TSC-93 TACSAT

E.2(a) Design for Supportability

The TSC-85 has substantial built-in redundancy, while the TSC-93 does not. BIT/BITE is ambiguous, requiring reliance on a cumbersome combination of technical manuals, NET-provided handouts, and board-swapping to complete the fault isolation. Central BIT/BITE will point to a quadrant of the system, where indicator lights point to a module or group of modules. These lights must be interpreted using the -34 manual, backed up by -10 manual diagrams. Users and maintainers rate BITE good in some subsystems and bad in others.

System availability of the TACSAT has been called into question in Europe, driven in the main apparently by the inconsistency in the maintenance concept, an imbalance between systems and PLLs, and the variations in employment concepts relative to assignment of TSC-85s and the Electronic Maintenance Shop (see the following discussions on Maintenance and Supply for TACSAT).

In Korea, one unit had not used its TACSAT for about a year and a half after fielding because of similar concerns about supportability. While both units in Korea are now fully operational (though non-doctrinal), they rely heavily on the redundancy of the -85 and on end item backups for both systems. In addition, reliability of the generators was a concern expressed in Korea at the 122d Signal Bn.

E.2(b) Maintenance

Assessment of the logistics process for TACSAT is clouded by the varying fielding status of the sites visited. At Fort Bragg, systems are in place at the 50th Signal Battalion whose support package has never been fielded. At the 72d Signal Battalion in Europe, a partial fielding has occurred, and the unit was advised to deploy only 50% of its systems because replenishment spares were not available. At the 93d Signal Brigade, full fielding has occurred, and no support constraints were cited. At the 229th Signal Company in Korea, eight each of the systems were fielded and are being deployed and maintained completely by soldiers since May 1987 when the contractor departed (see the note above concerning initial supportability problems prior to that date).

The following comments on maintenance are provided within this spectrum of system status. But it is noteworthy that the 50th Signal Battalion (CONUS) sees its support problems as a low density system characteristic, the 93d Signal Brigade (Europe) sees its support problems to be failures in the total logistics system, and in Korea the nonavailability of spares is seen as the biggest problem in maintaining the systems.

There are notable deficiencies in the maintenance process for TACSAT:

- Personnel shortages, with only 50-60% of authorization for maintenance personnel, although no maintenance workload burden was cited. (Exception exists in Korea where maintenance personnel frequently exceeded the authorization.)

- AIT produces an apprentice whose exposure is to GS requirements, while the need in the battalion is primarily for DS capability. The result is a need for extensive in-unit OJT.

- BIT/BITE to the TSSP, HVPS, and Up/Down-Converters is considered good, but is considered deficient to the modem and mux.

- Technical manuals are not sufficient and troubleshooting instructions are incomplete. Thus, NET handouts are used and are considered to be better than TMs in conciseness, clarity, and utility.

- TMDE is considered deficient in that the fielded equipments don't match the NET demonstrations or the school versions.

While these are important problems, they do not represent the most significant issue, which is a poorly conceived support concept. It appears that little attention was paid to the need to correlate the support concept to O&O requirements. There are a number of factors that led to this observation:

- SATCOMA reported that no PLLs were fielded with the TSC-85 terminals, partly because of the -85's redundancy, and partly from the belief that they would be deployed collocated with the Electronic Maintenance Shop. This deployment concept is completely erroneous.

  -- In the 93d Signal Brigade, the TSC-85 terminals support widely dispersed headquarters -- VII Corps Main and VII Corps Rear. In the 72d Signal Battalion the TSC-85 terminals are dispersed between FRG (EUCOM/USAREUR) and Italy (SETAF, an "unofficial" deployment at USAREUR's initiative, and unplanned by the PM Office). These units are placed in an immediately deficient posture because of the EMS decision, to the extent that reliance on TACSAT in the USAREUR GDP is suspect.

  -- Because of the PLL shortfalls (10 PLLs for 16 terminals in the 72d Signal Battalion, 5 PLLs to support 6 terminals in the 93d Signal Brigade), the units are forced into an allocation of shortages. The problem is further exacerbated in the 93d Signal Brigade because the TSC-85 terminals are assigned to one battalion and the TSC-93 terminals to another.

  -- Because of the PLL resupply shortfalls in Korea (the 10 PLLs originally issued have dwindled), the units are forced into an allocation of spares to three Area Maintenance Teams, although the repairmen are deployed with the systems. As supplies continue to dwindle, spares may be held at a central location while the repairmen stay with the deployed systems.

- Provision of IGS maintenance for TACSAT is very convoluted, and results in an uncertain go-to-war posture. The capability ranges from battalion-organic in the case of the 72d Signal Bn to an EAC requirement for the 93d Signal Bde for which no capability exists, to a dependence on PCS DOL for CONUS units. This confusing network not only affects individual unit readiness ut it also perturbs the interrelationship between overseas and .JNUS systems vis-a-vis personnel reassignments and skill maintenance.

At the bottom line, the integration of maintenance support concept with reality is deficient, and leads to uncertainty about system performance. peacetime usefulness, and sustainability in a go-to-war posture.

E.2(c) Supply

Spares support for TACSAT systems offers interesting contrasts to that of the GSC-52 strategic terminal. Most notable is the degree of confusion surrounding PLL authorization and distribution. Whereas the GSC-52 PLL unambiguously allocates one of every selected NSN as a spare to each site, the TACSAT sparing concept is to authorize a PLL quantity of one for each TSC-93 supported; for a typical unit having one -85 and four -93s, the normal PLL quantity would then be four spares to support five end items. There are exceptions, notably in those units with a much larger ratio of -85s to -93s, in which case PLL quantities are more than one per -93, but less than one per -85; such exceptions increase the confusion as to what spares support is really needed.

This sparing concept can result in significant readiness problems, parallel to those discussed in the area of maintenance.

- The 72d Signal Battalion has PLL quantities of ten to support sixteen TACSAT terminals (six -85s, ten -93s). As noted in the Maintenance section, the TSC-85 terminals are dispersed between Germany and Italy, and the Battalion is therefore forced to allocate at least some of the spares to the -85. In Korea, the 229th Signal Company faces a similar problem: the deployment of eight -85s and eight -93s forces allocation of spares shortages and area coverage by repair teams.
- The 93d Signal Brigade has five spares to support six terminals (two -85s, four -93s); thus, its PLL authorization was an exception to the rule. However, both TSC-85s are assigned to one battalion without any -93s, and so the single PLL has to cover the two dispersed -85s.

The reason for this state of affairs is not clear to the project team. The original SATCOMA plan appears to have been to have a single PLL with varying quantities to support the total -85/-93 density in the unit (nominally two -85s and three -93s). As a result of operational testing, a TRADOC requirement surfaced to collocate spares with every TSC-93; this caused SATCOMA to increase the total PLL quantities, but not enough to provide one spare for each system. The result is a general perception that <u>all</u> of the -93s need collocated PLL but only <u>some</u> of the -85s do; hence, the users we interviewed perceive a critical spares shortfall for the TACSAT systems. This confusion is further compounded by the recent ERPSL authorization being transmitted to the field; the units don't know what items and quantities are to be the ERPSLs for which systems.

Aside from this problem, TACSAT supply is similar to the other low density end items in the sample. There are approximately 4,000 distinct NSNs in the two TACSAT end items (including all versions, LRIP and "A" models) that can be removed/replaced in the field. Initial field stockage was limited to 95 of them as "PLL"; some of those 95, along with some common attaching hardware and other pieceparts, were included in a "DS ASL" at fielding. The narrow range of PLL lines, relative to the large number of maintenance-significant NSNs in the end items, has resulted in low demand coverage of initial-issue PLL; for example, the 93d Signal Bn reports that only two out of the last 18 spares required in maintenance appeared on the PLL/ASL.

At the wholesale level, out of the 4,000 total NSNs, at least 465 are managed by CECOM, of which 400 are "stocked"; however, most of those stocked lines were manually forced, overriding CCSS criteria. Nearly all of the 400 stocked lines have serviceable wholesale assets, but one-third have outstanding back-orders as well; this suggests that shortages are being allocated among users and, perhaps, between replenishment and initial requisitions. As part of the intensive management of TACSAT spares, practically all of the CECOM-managed NSNs are local-controlled items; as a result, every requisition must be manually reviewed by the Item Manager for approval.

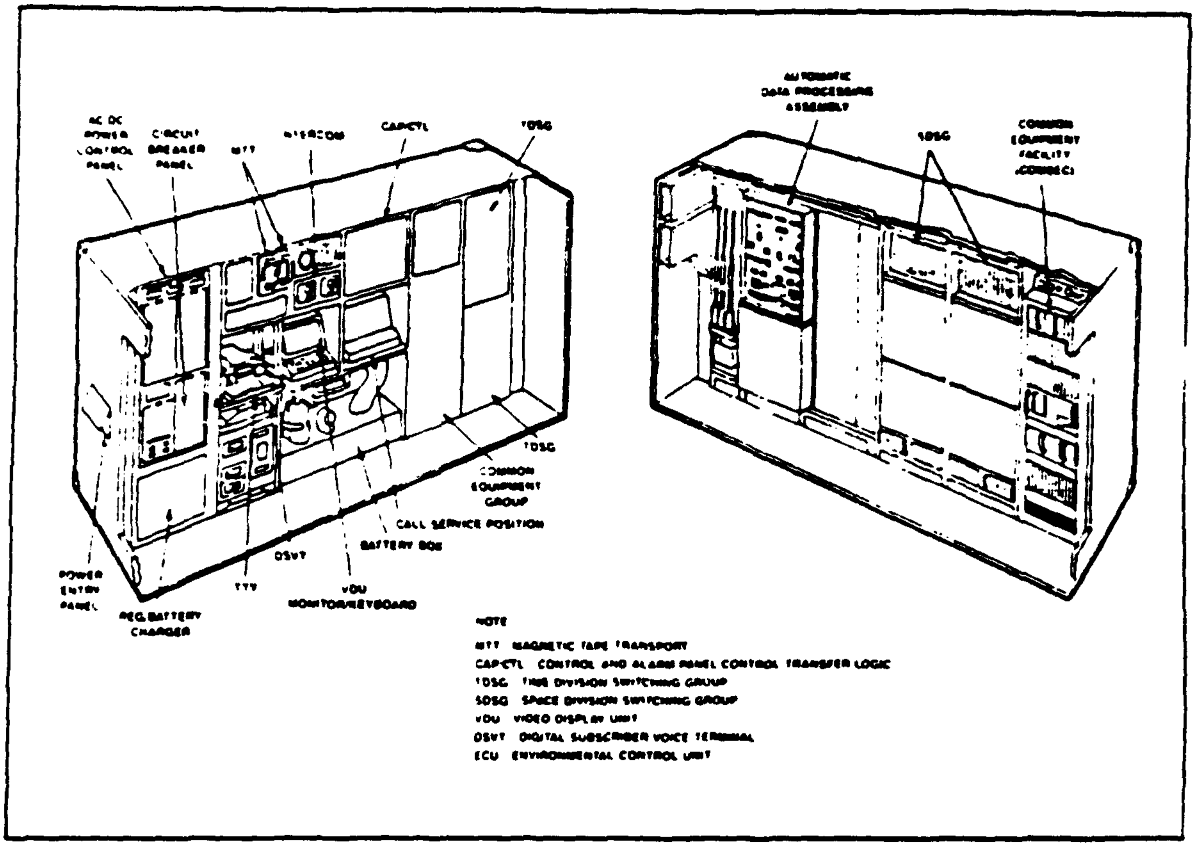
Both PLL and wholesale pipeline requirements were established manually offline by the PM Office, rather than using either CCSS or SESAME calculations. Formal application for ERPSL authority was initially rejected, and the end items were fielded without either ERPSL or MPL authorization for stockage; repeated attempts by the PMO to obtain ERPSL approval were finally successful during CY-1987; however, by this time, the "ERPSL" concept had begun to be purged from Army regulations, leaving the PMO having to start over in the MPL process to formalize the authorization of non-demand-supported stockage.

At the bottom line, the most urgent supply concern should be the resolution of PLL (ERPSL/MPL) requirements, distribution, and management in the field.

E.2(d) Readiness

The TACSAT sets' readiness is reported; however, until recently, TSC-85 users had been reporting the system down as if there were no redundancy, following guidance in the tech manual. Current guidance from CECOM, however, has factored redundancy into reporting for the -85, thereby correcting the problem.

AN/TTC-39
300-LINE SINGLE SHELTER SWITCH



The AN/TTC-39 and the AN/TYC-39 (TRITAC Switches) are transportable, automatic, modular switches. The TTC-39 is a circuit switch and the TYC-39 is a store and forward message switch. These switches are the heart of the TRITAC communications system and are normally deployed at corps and above.

Significant data:

Density:	TTC-39 = 32; TYC-39 = 33
Unit Cost:	TTC-39, $2.4 Million; TYC-39, $3.0 Million
MTBF:	Not tracked
MTTR:	Not tracked
PLL/ASL:	180-360 lines
No. Provision Lines:	65,503 (both switches; substantial commonality)
Operator:	72G
Unit/IDS Maintainer:	36L

E.3 TTC-39 and TYC-39 TRITAC Switches

E.3(a) Design for Supportability

Redundancy is considered an essential element in the design of the TRITAC switches. BIT/BITE of the switches (excluding the new TTC-39A, which was not yet in regular use in sites we visited) was judged about average for the sample systems. In some cases the diagnostics isolate unambiguously to a single LRU (circuit card or module). In many cases the area of ambiguity can be quite large; for example, the core stack in the processor area is considered one of the biggest maintenance problems, due to the large number of cards which must be manually fault-isolated after the BIT/BITE has gone as far as it can. To some extent these diagnostic ambiguities are narrowed by the use of external TMDE and manual procedures documented in the tech manuals. Additional capabilities are said to be possessed by the production contractor's field tech reps, in the form of special test sets and self-diagnostic magnetic tapes; CECOM is in the process of acquiring these additional capabilities for distribution to the LARs.

Reliability of the switches was cited by users as a problem only with regard to displacement; that is, the switches will continue to work for a long time as long as they are not moved, but displacement in a tactical exercise often leads to a maintenance problem when trying to restart the switch at the new location. Such problems are not normally "hard" failures; instead, they may be the result of loosening of electrical connectors which are difficult to troubleshoot. In Korea, users make sure that card cages and drawers are secured prior to movement to avoid this problem.

The TRITAC Program Management Office expects the new TTC-39A switches to offer significant improvement in both reliability and maintainability. Most importantly, perhaps, is the fact that the new switches will use a newer generation of Litton processor having far fewer circuit cards, better reliability, and better BIT/BITE. Essentially all TTC-39(V) switches are to be retrofitted to the "A" model (budget permitting), but improvement in the TYC-39(V) is not included in that plan; thus, there will be two processor versions requiring support for the indefinite future.

E.3(b) Maintenance

Organizational through GS maintenance of the TRITAC switches is performed on-site by soldiers, with the exception of Fort Bragg where a contractor representative remains. Units complain that training is inadequate for the system and that maintainers require one-and-a-half to two years OJT to become competent on the system. Technical manuals are stated to be satisfactory but written at too low a level for the users. Maintenance actions that are deadlined are awaiting parts. In Korea, personnel are in excess of the authorization and there was no apparent maintenance workload burden. Workarounds are used to fault-isolate failed LRUs, with redundancy being the primary contributor to readiness.

In Korea, the Air Force's maintenance concept includes the use of a cabinet of boards, called the "Special Purpose Recoverables, Authorized to Maintenance (SPRAM) kit. This is an extension of the test capability, as the kit contains

one or more of each of the boards in the -39, and is used to isolate the failed board after the drawer has been identified by BIT/BITE. The SPRAM is used only for troubleshooting: once the failed board is identified, a good one is requisitioned from the Base Supply War Reserve Spares Kit (WRSK); the SPRAM boards are not used as spares. The SPRAM boards were free-issue to the unit and are shown in the Air Force inventory system as "on loan" to the unit.

E.3(c) Supply

There are roughly 3,500 NSNs in the TTC/TYC-39 switches authorized for field-level removal/replacement. Field stockage of these NSNs is entirely PLL, with initial stockage containing up to about 360 LRU lines. Initial fielding of each system was accompanied by a dedicated supply van complete with spares; a total of 245 lines were authorized as PLL for the TTC-39, and 211 lines for the TYC-39 (there are 103 lines in common between the TTC-39 and TYC-39). While ERPSL/MPL authority was never approved, all the units we visited are retaining the original PLL quantities, with no evidence of higher-echelon review. In addition there appears to be a large number of IGS-level pieceparts being carried as "bench stock" in the PLL vans, whose initial issue source was not documented.

Field units indicated that PLL stockage for the -39 switches (but not for the TTC-39A) meets requisitioning requirements only about half the time. Gaps in BIT/BITE capability lead to board-swapping, which in turn leads maintainers to want "one of every card in an ambiguity group" to be authorized on the PLL, and this may eventually lead to field-initiated PLL increases.

More recently, the support plan for the new TTC-39A switch will drastically reduce the number of PLL lines authorized, from 245 NSNs down to only about 40 CECOM NSNs. This change has gaining units in Europe and Korea so concerned that they are starting to seek and obtain formal local approval, at the general staff level, for non-demand-supported PLL, in accordance with the terms of *AR 710-2 [para. 2-20(a)(2)]*: this is the only one of all the end items in the sample that has sought such authorization. The PMO indicates that the decision to reduce the PLL range is the result of three factors:

- Product improvement in the central processor area, with significant reduction in the number of components and increase in the reliability;
- Inability to compute greater requirements in SESAME runs; and
- Insufficient budget authority to procure greater numbers of spares.

At the wholesale level there are about 500 CECOM-managed NSNs, of which most are classified as "stocked"; the table below shows the proportion of CECOM-managed NSNs which are stocked, the proportion of those which have on-hand serviceable assets, and the proportion which have outstanding backorders.

End Item	Stocked %	Asset %	Backorder %
TYC-39	85%	95%	16%
TTC-39	93%	87%	11%
TTC-39A	99%	97%	14%

Replenishment of retail levels appears to follow standard Army channels; as with most of the sample systems, users express concern that the resupply pro-

cess for depot reparables often involves proving to CECOM that a turn-in was made, which adds to the resupply delay and manpower requirement.

At the bottom line, the most pressing of these issues is judged to be the need to reconsider the PLL/ASL stockage requirements for <u>all</u> of the TTC/TYC variant end items, with a particular eye to the TTC-39A, and subsequent publication of ERPSL/MPL authorization to support the results formally.

E.3(d) Readiness

The TRITAC switches' readiness is reported, but there are no objective criteria by which the switches are counted as "up" or "down"; it is the Commander's call as to whether a switch is "capable of performing its mission", which is the criterion included in the tech manual. This ambiguity results in part from the fact that redundancy in each switch depends upon the particular application, configuration, and traffic intensity experienced by the switch. Nonetheless, the 93d Signal Brigade (USAREUR) was the one unit interviewed that had developed its own internal reporting criteria; however, troops in the 93d are not uniformly aware of their own rules, or in agreement with them, or following them in their reporting. In Korea, the system is reported as "green" unless completely off the air; thus, redundancy achieves the readiness posture.

AN/MLQ-34
TACJAM

The AN/MLQ-34 is a division/corps-level special purpose countermeasures system. It is a transportable, ground based VHF communications jamming set and is housed in an S-595 shelter. Its prime mover is the M-1015 which is equipped with a mounted 60 KW generator.

Significant data:

Density:	16 as of May 1988. 111 on hand or on order plus others planned.
Unit Cost:	$2.5 Million
MTBF:	ROC Spec 250, Prime Contract: 62 (CFE only) met test: 5-6 hours average in field.
MTTR:	Not tracked
PLL/ASL:	351 lines on EMRA SLAC, including contractor requirements
No. Provision Lines:	14,794
Operator:	98G
Repairman:	33T - critical shortages

E.4 MLQ-34 TACJAM

E.4(a) Design for Supportability

As with the satellite systems discussed above, fault detection and isolation are accomplished through a combination of BIT/BITE, the -24 tech manual, and board swapping. A confusing interplay of MAC, levels of maintenance, soldier maintainers and contractor maintainers, is evident with this system. The assessment of troubleshooting capability is further compounded by personnel manning and training problems (discussed in the *Maintenance* section). There is just one BIT/BITE suite on-board the MLQ-34, but both the Unit-level and IDS-level personnel use it; it is not clear from either the documentation or from discussion with personnel just where the unit maintenance responsibility ends and the IDS begins. Thus, in some cases the BIT/BITE isolates electronics to a unit-level drawer (black box), and in other cases to an IDS-level circuit card (particularly in the power amplification area); the specific use of BIT/BITE appears to be whatever the maintainer on the scene -- be he GI, contractor, or LAR -- can exercise to solve the problem.

A more glaring design-for-supportability problem exists with the M-1015 carrier. The carrier and the TACJAM system are totally incompatible:

- The excess weight of the system stresses the carrier suspension, resulting in frequent track failures; and
- The MLQ-34 relies on an on-board 60 KW generator driven by the M-1015 power pack, which must be operated at 2200 RPM to drive the generator, resulting in frequent power-pack failures.

TACJAM sample data collection indicates track failures occur about 40 percent more often than mission electronics failures (83 events *vs.* 60 in Jun-Dec 87); including power, M-1015 failures are more than 60 percent more frequent (97 events *vs.* 60). M-1015 problems have placed the MLQ-34 in a very poor readiness posture, with commanders losing faith in system availability. As a result, TACJAM is considered unreliable. When used, the MLQ-34 does not operate in its intended O&O concept of jamming and quickly moving before its position became known: instead, in current exercises it jams as required but seldom moves.

E.4(b) Maintenance

The maintenance process for this system is severely deficient. Reliance on contractor logistic support (CLS) at all levels of maintenance, with the contractors providing all IGS repair, renders the using units incapable of wartime mission performance. The key observations are:

- On-equipment troubleshooting and maintenance is a hodgepodge of BIT/BITE, soldier operators and maintainers, contractor maintainers, technical manuals, and board-swapping. Demarcation of levels of maintenance and MAC is virtually impossible.
- Maintenance personnel shortfalls (1 MOS 33T assigned against 13 authorized) simply forces contractor maintenance deeper into the maintenance system.

- Shortages in the LRU pipeline place a heavy reliance on LRU repair-and-return from the contractors.
- The MSM-105 was to be the principal IGS ATE, but TPSs have yet to be fielded, and so the contractors bring proprietary capability to IGS performance, using USM-410 as well as STE.
- The M-1015 is the principal maintenance burden, yet system operators are not trained in track operator maintenance. EMRA's sample data indicates that 4½ times as much maintenance manpower is required to tend the track as the mission electronics (685.4 man-hours track *vs.* 153.3 electronics, June-December 1987).
- Organizational and IDS maintenance responsibilities for the MLQ-34 are both organic to the battalion. IGS is the contractors' responsibility. Because of the severe personnel shortfall in MOS 33T, the maintenance task at all levels would go unaccomplished if it were not for CLS intervention. The CECOM LAR is generally capable of providing maintenance assistance, but the provisions of *AR 700-4 (Logistic Assistance Program, dated 1 JAN 80)* are viewed by some LARs as prohibiting any hands-on involvement. [For additional discussion, see ***Chapter IV, Section C.1(d)***, *"The LAR's Role"*.]

In summary, two key observations should be made about TACJAM maintenance:

- Maintenance of the M-1015 is an overpowering challenge to personnel and to the credibility of the MLQ-34 system; and
- Intensive efforts to resolve the critical MOS 33T personnel shortfall are an essential precursor to correcting the heavy dependence on CLS.

E.4(c) Supply

Data provided by EMRA indicates roughly 750 NSNs in the MLQ-34 TACJAM are significant removal/replacement items in maintenance at IDS and Unit levels, including just the prime mission electronics (*i.e.*, excluding M-1015 vehicle and generator parts); just 34 of these NSNs are EMRA-managed. At present there are 23 items that are recommended by EMRA for stockage in the field in PLLs organic to the MI Battalion, of which 14 NSNs are reparable LRUs. Additional stockage of LRUs, along with a limited number of those SRUs (such as the Basic Power Module) that GIs are authorized and capable to replace, are recommended for stockage at the MI Bn's SIEW shop. While the total of these higher-echelon parts on the current EMRA list (SLAC) includes 351 NSNs, in practice few of these other lines are carried. As examples, the 124th MI Bn at Fort Stewart carries only 31 lines in total on its PLL/ASL for TACJAM; the 108th MI Bn reports only 65 lines on its PLL.

As the numbers above indicate, the range of TACJAM spares stocked in the field represents a narrow sliver of the maintenance-significant item population. Moreover, EMRA indicates that initial provisioning quantities of TACJAM LRUs were low, and that replenishment procurement has been practically nonexistent; this results in persistent shortages of LRU assets. Since replenishment assets are not available, unserviceable LRUs must be repaired in the field rapidly enough to maintain readiness rates; since LRU repair has not yet transitioned to Army capability, this situation increases dependence on contractor support. It is possible that most of the "ASL" lines mentioned above are stocked only by the repair contractors.

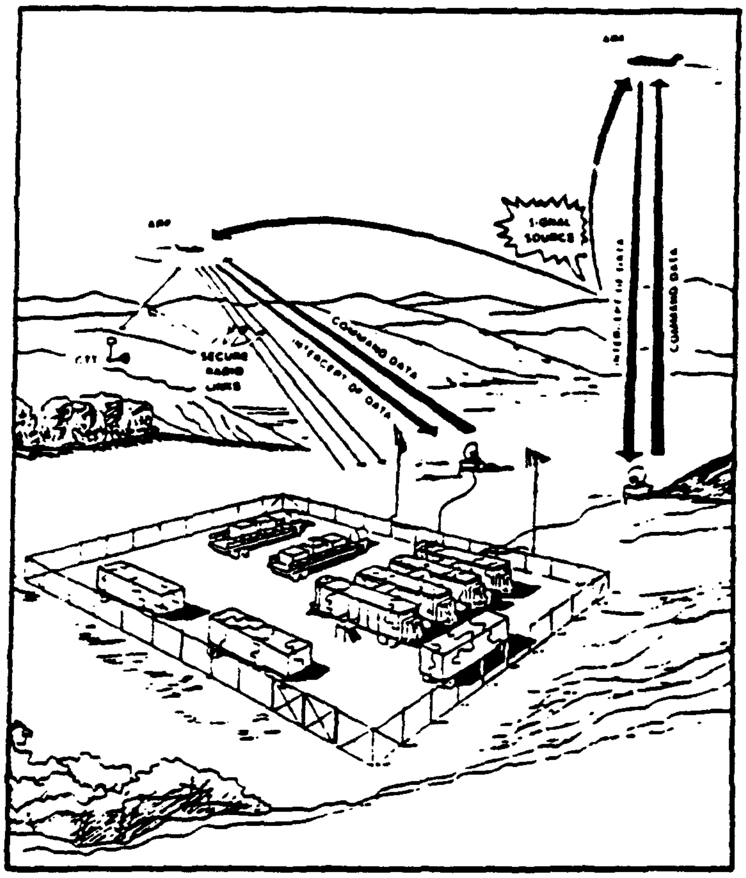
Replenishment requisitions for organically replaced spares appear to follow standard Army channels. It is not known to what degree, if at all, contractor repair actions rely on Army-stocked or contractor-stocked SRUs and pieceparts. Wholesale-level statistics on supply performance were not provided by EMRA.

At the bottom line, there is a general perception, reported by both users and EMRA, of insufficient spares supply for TACJAM resulting from a combination of low-level initial sparing quantities and continuing delay in transitioning in-theater LRU repair capability to the Army. In addition, it is not clear whether the vehicle subsystem (M-1015) is receiving as much supply-support attention as is the prime-mission electronics suite.

E.4(d) Readiness

TACJAM readiness is reported, but the numbers are confounded by two factors. First, the combination of redundant channels and rare usage (in jamming mode) leaves the up/down determination highly subjective. Second, readiness of the system is heavily degraded by the transport subsystem. EMRA's sample data collection indicates average readiness of 62.7 percent availability for sample TACJAM systems in Germany and CONUS; the track is charged with at least 80 percent more non-mission capable events than the electronic mission equipment (64 *vs.* 35 events during June-December 1987).

AN/USD-9A
IMPROVED GUARDRAIL V



The AN/USD-9A, Improved Guardrail V, is a combined airborne/ground remotely controlled communications intelligence system. It is designed to provide intercept and direction finding information on tactical enemy emitters. This information is processed and reported in near real-time to tactical commanders at corps level and below.

The improved Guardrail V is comprised of the following:

- AN/ARW-83(V)4 ARF mounted in six RC-12D aircraft (two aircraft per mission).
- AN/TSQ-105(V)4 IPF mounted in four interconnected 8 x 40-foot vans.
- AN/TSC-87 CTT (up to 32 terminals) at the supported commands.
- AN/ARM-163(V)4 AGE, a mobile flight line maintenance/test set.
- STE located in an electronics shop AN/GSM-271A (IPF maintenance van) and electronics shop AN/ARM-185A (ARF maintenance van).

Significant data:

Density:	2 (both in USAREUR units)
Unit Cost:	$70 Million
MTBF:	Not tracked
MTTR:	Not tracked
PLL/ASL:	Approximately 400 PLL lines (1st MI Bn)
No. Provision Lines:	71,219
Repairman:	33R - critical shortages

E.5 IGR-V Improved Guardrail

E.5(a) Design for Supportability

BIT/BITE covers two thirds of the system, with box swapping required to complete fault isolation. IGR-V is another system with a confusing mix of BIT/BITE, maintenance personnel interactions (on-site maintenance includes Unit through Depot levels), and box swapping. In this case the driver is a real-world combat mission performance requirement: 50 percent of TOE capability. This system is a classic example of a fielding with incomplete ILS accomplishment. Pervasive gaps in ILS are filled by a mixture of civilian and military personnel, with three different contractors deeply embedded in the system support structure.

E.5(b) Maintenance

Peacetime employment of this system is requiring a utilization rate at about 50% of TOE combat capability. Thus, this logistic support assessment for IGR-V is based on an O&O as close to full mission requirements as will be found for tactical equipment in a peacetime setting. On the other hand, this system has been fielded in such a dedicated logistic support environment that the military support structure is not being truly challenged.

The maintenance concept for IGR-V prescribes three-level maintenance organic to the battalion. This concept is compatible with the unit mission, but its execution invalidates unit combat readiness by relying on a dedicated support team comprising capability across all maintenance echelons from site to depot.

The maintenance team supporting IGR-V includes military personnel, full-time contractor personnel, and full-time depot (SAAD) personnel. In general, military personnel do on-equipment maintenance and CLS/SAAD personnel do off-equipment maintenance. However, because of both maintenance personnel deficiencies (2 of 14 personnel with IGR-V maintenance training) and extensive OJT requirements, both contractor and SAAD personnel are closely involved at all maintenance levels, and the distinction between on-equipment and off-equipment maintenance becomes blurred. This is most evident in the AGE van during preflight system checkout and troubleshooting. Further, all data link maintenance is done by CLS. The essence of these observations is that the military maintenance structure is incapable of achieving mission readiness. In this regard, concern was expressed over the phaseout of logistic support contracts.

There are other maintenance system deficiencies -- initial spares provisioning is incomplete, box swapping required to augment BIT/BITE to complete fault isolation, TMDE deficiencies, particularly with data links and the data mux/demux are examples. But the fundamental issue is the essential matrix of GI-CLS-Depot maintenance personnel. Without this jury-rig, IGR-V could not meet its peacetime operational tasks, and probably cannot meet its surge requirements.

E.5(c) Supply

Responsibility for execution of supply support for Improved Guardrail is almost as widely dispersed as for maintenance. While CECOM is officially the

principal source of supply at the wholesale level, an unquantified but significant volume of supply is handled off-line through the SAAD repair-and-return program, which links the MI Bn directly to the repair depot, bypassing CECOM Item Managers.

Furthermore, with so many different wholesale and field-level repair entities -- multiple contractors, forward and rear depots, at least two Army NICPs (AVSCOM and CECOM), and green-suit personnel -- there are increased opportunities for gaps in supply coverage. A notable example found in the 1st MI Bn (AEB) concerns the airborne dipole antenna. Each RC-12D aircraft requires six to be installed and performing to accomplish its mission. The JLSP indicates that the airframe contractor (BASI) is responsible for removing and replacing dipole antennas, which are associated with airworthiness of the aircraft; but supply of spares is to be "supported by the Government, with assistance of the PME contractor". In field usage the antennas are subject to wear and tear more than to electronic failure, but the initial sparing of field stockage to the 1st MI Bn did not include dipole antennas; apparently the item was not spared adequately at the depot either, because the 1st MI Bn had Guardrail aircraft out of action for a 15-week period the first time it requisitioned replacement dipole antennas.

Retail spares for IGR-V are essentially all contained within PLL organic to the MI Battalion; exceptions include a few common reparable items which may be spared at AVIM or IGS in support of other end items. The 1st MI Bn (AEB) is currently authorized stockage of 407 lines, all of which were recommended by the PM Office based on engineering judgment; despite concerns over the range and depth of certain lines, the unit has not attempted to increase the PLL beyond those recommendations, under the assumption that "it's a low density system, and CECOM would not authorize any increases."

Initial provisioning of spares was led by the PM Office, manually selecting the items for stockage based on engineering judgment and generally procuring a total of three each -- one for each of the two sites, plus one at depot level for the repair/return program. Additional supply problems were created by fielding end items with less than the full complement of on-board equipment; this is particularly severe in the case of two receivers -- R-924 and R-2017 -- which were deployed with only 25 installed LRUs out of 54 (R-924) or 30 (R-2017) required. Because of these shortfalls in issue against TOE, the unit must swap receivers between aircraft in order to achieve full capability. Normally, one aircraft will be undergoing scheduled maintenance at all times, and its "de-racked" PME makes up the five R-2017s difference; but the R-924 is permanently short twenty.

At the bottom line, the IGR-V has its supply support, like its maintenance support, more highly tailored than any other system in the sample.

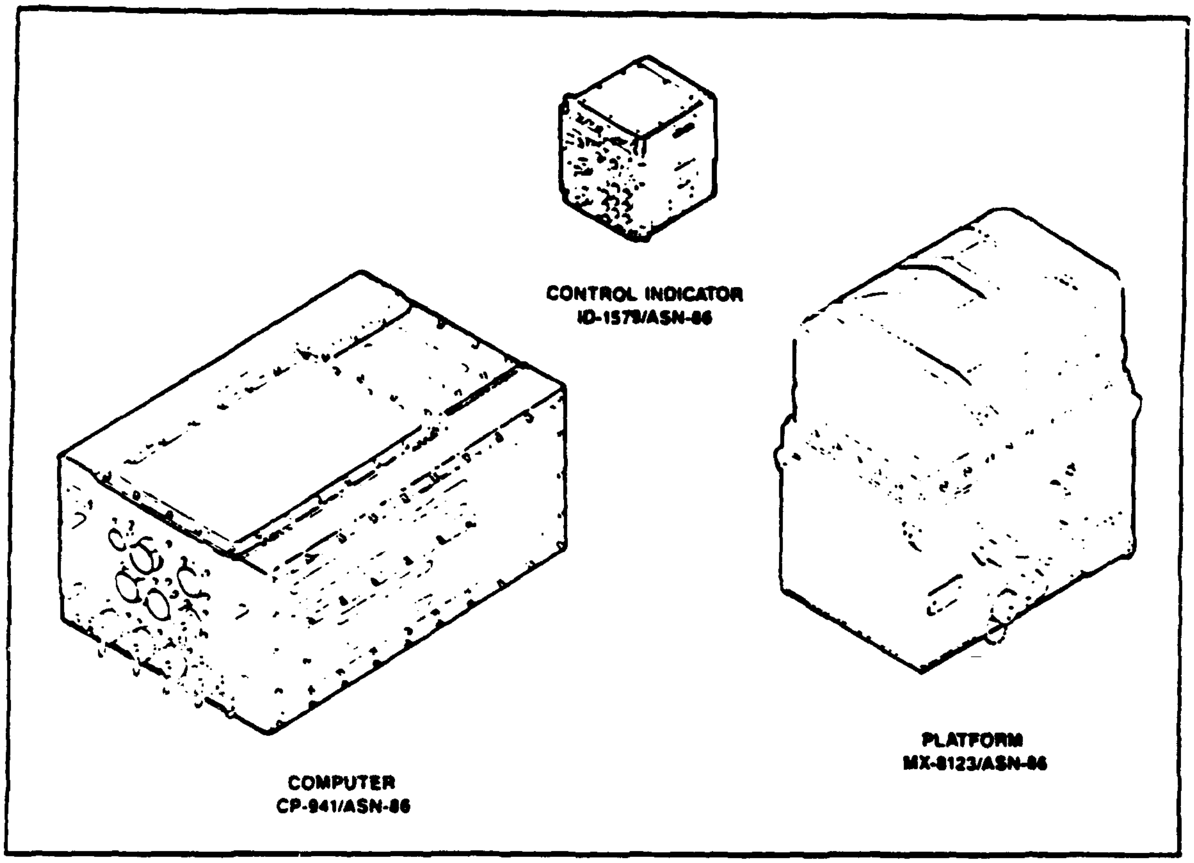
In Korea, while there is no IGR-V, discussions with the 3d MI Bn concerning supportability of GRV led to the conclusion that supply support and repair turnaround time are the biggest problems. The unit stated that of the 1,283 lines on its consolidated PLL (GRV plus other systems), 278 are demand supported and that these higher failure items are even more difficult to resupply than the nondemand-based items. Controlled substitution is considered a way of life in the unit to meet its mission requirements.

E.5(d) Readiness

IGR-V readiness is reported formally as "mission capable (MC) rate" *only on* the aircraft (AVSCOM elements), but does not include any of the mission equipment (CECOM elements): so long as the aircraft is capable of safe flight, IGR-V is reported as mission capable on form DA-1352, with a target of 80 percent specified in *AR 700-138*. Any problems with mission equipment (airborne or ground) are reported only as comments on the reverse side of the form and affect "fully mission capable (FMC)" rate, targeted at 70 percent. While such problems may receive attention and followup action by addressees, they do not acquire Army-wide visibility.

All AEBs visited report that they are mission ready. Intensive supply management and followup, and off-line support by SAAD and the on-site contractors, contribute to this performance. In contrast, the 3d MI Bn believes that the SLAR system and its mission are in greater jeopardy than Guardrail because of poor supportability: *further, with the receipt of the Common Sensor* system scheduled for this Fall, the unit anticipates both maintenance and supply conditions will worsen.

AN/ASN-86
INERTIAL NAVIGATION SET



The AN/ASN-86 Inertial Navigation Set is a self-contained navigation and attitude reference system. The ASN-86 system is used in the OV-1D MOHAWK aircraft and RV-1D, RU-21A/B/C/H aircraft. The greatest density of the ASN-86 system is in the MOHAWK OV-1D aircraft. The major LRU components of the ASN-86 system are the gyro-stabilized platform unit (GSPU), the navigational computer unit (NCU), and the control indicator unit (CIU).

Significant data:

Density:	166
Unit Cost:	$453 Thousand
MTBF:	1000 hours specified; 300 demonstrated-field data supports 22-90.
MTTR:	Not tracked
PLL/ASL:	30-40, including excess LRUs
No. Provision Lines:	4,878
Repairman:	35R (R5)

E.6 ASN-86 Inertial Navigation Set

E.6(a) Design for Supportability

Fault detection and isolation in this system has a different characteristic. BIT/BITE isolates 90 percent to the LRU, which is one of three black boxes, to the Unit level maintainer. A bad LRU is then connected to a ·ot mock-up test bed, that is itself deficient in certain analog and digital signals and in cockpit avionics (the mock-up requires cockpit instrumentation to function). Its resulting fault code isolates to two or more cards; board swapping is then used to isolate to a single card, using good cards pulled from a good system (there are excess ASN-86s in each unit visited).

A system design problem is reported in the compatibility of the ASN-86 with the OV-1D aircraft (Quicklook), where a fluctuation from constant voltage requires frequent reloading of the Navigational Control Unit memory: maintenance personnel cited the power inverters as the cause. Spikes also cause the heater pads in the gyro platform to fail.

E.6(b) Maintenance

The maintenance perspective on the ASN-86 is similar to that for the IGR-V -- a totally integrated CLS involvement at all maintenance levels, and for essentially the same reasons:

- Personnel shortages (MOS 35R-R5) against authorizations,
- Inadequate AIT training, requiring extensive, contractor-supported OJT,
- Some complex tasks that are inadequately supported by BIT or TMDE.

There are, however, other significant maintenance-related observations to make. In addition, certain supply aspects of maintenance are very complex for the ASN-86; these are discussed in detail in ***E.6(c) Supply*** below.

An organizational issue was found in Europe and is worthy of comment. The MI (AE) Battalions in which in which the ASN-86 is found are authorized to perform AVUM and AVIM maintenance on the system. These units also have maintenance and supply channels to the corps AVIM battalions for the aircraft, avionics, and ASL support. In VII Corps, AVIM support for the ASN-86 is found at the Corps level; in V Corps, AVIM support remains with the MI Battalion. The result of this overlap is, at least, a duplication in demand for MOS 35R. In Korea, while formal responsibility resides with the AVIM, the actual support is organic to the MI Bn by informal agreement. This organizational confusion should be resolved in the interest of contributing to solution of an otherwise dismal personnel posture.

At the bottom line, maintenance readiness of the ASN-86 is dependent on CLS. Further, the excess ASN-86 systems make assessment of the repair parts contribution to maintenance virtually impossible to assess. As presently supported, ASN-86 is not go-to-war capable.

E.6(c) Supply

There are about 450 NSNs in the ASN-86 authorized for field-level removal/replacement. Of these there are only three LRUs -- Gyro Stabilized Platform Unit (GSPU), Control-Indicator Unit (CIU), and Navigation Computer

Unit (NCU) -- as described in the section on Maintenance. All of these LRUs are presently designated as Class II nonexpendable items, which require formal property book accountability after issue from stock record accounts; because of the extra burdens this places on units, some are initiating requests to CECOM to redesignate these LRUs as Class IX technical spares.

All three ASN-86 sites we visited were Guardrail/Quicklook/APS-94 units, and none was authorized spares stockage of these LRUs. However, the separate TOE authorization for ASN-86s was filled, while the TOE authorization for aircraft was only partially filled; thus, shortfall in TOE aircraft creates a supply of INS LRUs for use as spares.

The unit may apportion these spares among the flight line (AVUM), the hot mock-up test rig, the INS shop bench, and the AVIM supply storage area. When additional LRUs are needed they are swapped out first from aircraft which are undergoing maintenance, next from aircraft used for training, and finally from other mission-ready aircraft. In both units the message was clear: there are no "excess LRUs", since units are barely able to keep enough LRUs working to meet the high peacetime usage rates common to aerial MI units.

The LRU supply problem is further compounded by the fact that the GSPU, which is the LRU that fails most frequently and whose maintenance is most difficult, is AIMI (Aviation Intensively Managed Item), with shortages allocated to users and no on-hand serviceable stockage authorized at the units. This leads to consistent supply and maintenance workarounds, and increases pressure to turn around repairs rapidly.

The repair process comes up against the AIMI restriction as well, most notably in two SRUs which are most often required to fix the GSPU -- the accelerometer and gyroscope -- and so both the GSPU and its two most critical SRUs are limited as to who can stock and requisition them.

In fact, AIMI control is so persistent a problem to the units that their perception is, "All the ASN-86 spares are AIMI"; they are surprised to find out that the AIMI spares are much fewer. For example, the current USAREUR AIMI list has only five NSNs in the ASN-86, including the GSPU and accelerometer.

At the wholesale level there are 117 CECOM-managed NSNs, of which 101 are classed as "stocked" items. Of these 117 NSNs, 75 have on-hand serviceable assets; twenty lines have outstanding backorders. Field perceptions are that backorders are cyclical; that is, certain lines are serious problems for some period of time, and then clear up, to be replaced by others.

At the bottom line, troop concerns with shortages of supply for the ASN-86 are exacerbated by the combination of spare shortages, informal TOE authorization for LRUs, and AIMI pressures; continued reliance on contractor repair in the field helps to lessen some of their concern, but calls into question their go-to-war capability.

E.6(d) Readiness

Since this is just one subsystem out of many on an aircraft, its readiness is not reported or tracked separately; it is, however, an item which will cause an aircraft to be reported as not mission capable in the units which we interviewed.

IV. FINDINGS

IV. FINDINGS

In the preceding chapter we identified a number of problems associated with the low density sample systems, and we discussed them in the context of the specific system-by-system operational and support environments. In this chapter we go into greater depth on the individual problems, exploring their root causes and indicating areas for specific correction. This chapter translates the specific system-by-system assessments into general systemic issues of concern to C/E Community and the Army as a whole.

The order of topics in this chapter is:

- ILS and Contractor Logistic Support,
- Supply,
- Maintenance, and
- Readiness.

In *Chapter V* we offer summary conclusions and recommendations in each of these logistic areas.

A. ILS AND CONTRACTOR LOGISTIC SUPPORT

Effective ILS support results from a disciplined approach to the integration of a number of factors: system design, RAM, O&O concept, resource availability, and organization, to name a few. For the sample systems, the full ILS package has, in the main, not been provided. System fielding has taken place by reliance on contractor support, identified in general as interim contractor support. Whether driven by expediency, funding constraints, incomplete staff work, incomplete contractor performance, or however many more reasons can be conjured, systems are being fielded with contractor support to fill ILS gaps.

The degree to which CLS fulfills the support task for these systems varies substantially. At one extreme is IGR-V, whose two systems worldwide rely on an on-site combination of contractor personnel and government depot personnel to execute the support mission, with the soldier in a largely supporting role. At the other extreme is the GSC-52 fixed station satellite terminal; while fielded with start-up CLS, execution of most below-depot maintenance tasks is now accomplished by organic maintenance personnel, with only occasional on-call emergency contractor support.

Between these two extremes are wide variations, both in tasks executed and in duration of effort. *AR 750-1 (paragraph 3-24)* requires that CLS be limited to short-term tasks, and *AR 700-4 (paragraph 3.3)* limits the use of CLS to one year. Neither of these policies appears to be enforced for the sample systems; on the contrary, the C/E Community is perpetuating CLS without apparent reference to policy or procedure, and without investment to close the gaps in ILS that prompted the onset of CLS. Further, there is no evidence that the cost-effectiveness of CLS has been challenged or validated, either in general or for any of the specific sample systems, as *AR 700-127* now requires.

A number of cause-effect relationships have appeared. First, CLS is becoming more entrenched in the support system for certain equipments. This condition manifests itself in contractor involvement at organizational maintenance level, contractor-performed repair and return of selected LRUs to cover shortfalls in supply, and extensive contractor involvement in the OJT task. An attendant blurring of MAC's task allocation is seen.

Second, growing reliance on CLS calls into question the capability of these systems to go to war. In cases where IGS-level repairs are being accomplished by on-site contractors, or where depot-level tasks are being performed in the field, this concern is that much greater because of the potential for even bigger shortfalls if such forward-echelon peacetime resources are moved back to their normal EAC position.

At the bottom line, CLS has been a success story, but its downside impacts must be reviewed objectively, case-by-case for the sample systems and for all other systems for which the C/E Community has support mission responsibility. The proper CLS acquisition approach is now embodied in *AR 700-127, para. 5-3*:

- The decision to use contractor support requires trade-off analysis as part of the LSA process;
- It must be "optimum among feasible alternatives", it must "provide the required support in both peacetime and wartime scenarios", and it must be "the most cost-effective method"; and
- "Wartime mission and deployment requirements will be the primary considerations on which support risks are based."

Guidance on the subject cannot be clearer than this.

B. SUPPLY

The principal issues which the study team has identified with regard to supply for the sample low density systems are as follows:

1. Intensity of offline item management attention at the wholesale level;
2. Intensity of offline item management attention at retail echelons;
3. Difficulties in procurement/reprocurement of spares;
4. Inadequacies in target range and depth of spares stocked at wholesale and retail echelons, both in initial issue and in the sustainment mode;
5. Shortfalls in initial issue, with respect to materiel fielding targets:
6. Confusion with regard to stockage authorization policies and practices, as well as changes/conflicts in those policies and practices; and
7. Impacts of maintenance on supply

The nature and impact of these issues are described in turn below.

B.1 WHOLESALE INTENSIVE ITEM MANAGEMENT

One of the most common concerns expressed at the NICP and user levels is the intensity of item management required by the systems sampled. At the wholesale level (CECOM DMM) there are concerns that automatic CCSS processes are

inadequate to maintain adequate supply and issue control. Workarounds include the following:

- Many of the spare parts have their supply control review, planning, and execution done manually, rather than through automated CCSS routines;
- Many of the spare parts are treated as locally controlled items, so that no requisition is filled until an Item Manager has reviewed and approved it;
- Most of the essential field-maintenance spares for these systems are automatically treated as "non-stocked" items by CCSS, on the basis of their forecast low demand and high price, and so CECOM Item Managers must intervene and manually freeze them into the "stocked" category or they will be dropped automatically; and
- Where manual Item Management actions are taken, CCSS stockage levels of the items may be inadequate, requiring Item Managers to apply their own factors to set target levels.

While these concerns were voiced as "low-density/low-demand problems", such wholesale-level workarounds are not unique to low density systems: some of the same practices are found for the highest demand items at CECOM. They are used to cope with a variety of problems: bad data in the CCSS, with manual adjustment of computer output each review period rather than a onetime fix to the input data; acute or chronic shortage of an item, regardless of cause; and low return rates from the field, particularly when supplies are short.

Moreover, application of these workarounds is not consistent; for example, the ASN-86 was cited by CECOM as a demand-supportable system, for which the CCSS adequately maintains planning and management control over spare parts; yet its secondary item supply availability is currently only 68% (CECOM average 85%), and its average in FY87 was only 75%.

While there are similarities between high density and low density systems with regard to observed workarounds and other kinds of intensive supply management, there are particular low density effects which must be recognized and dealt with as such to improve wholesale item management.

What makes wholesale item management especially difficult for low density systems is that most of their essential spares experience very low demand levels. This low demand characteristic has two serious implications:

- It causes the CCSS periodically to recommend moving such items from "stocked" to "non-stocked" status, thereby forcing item management workarounds to retain their status as stocked; and
- It challenges both automatic and manual item management formulas for forecasting demand and establishing stockage levels.

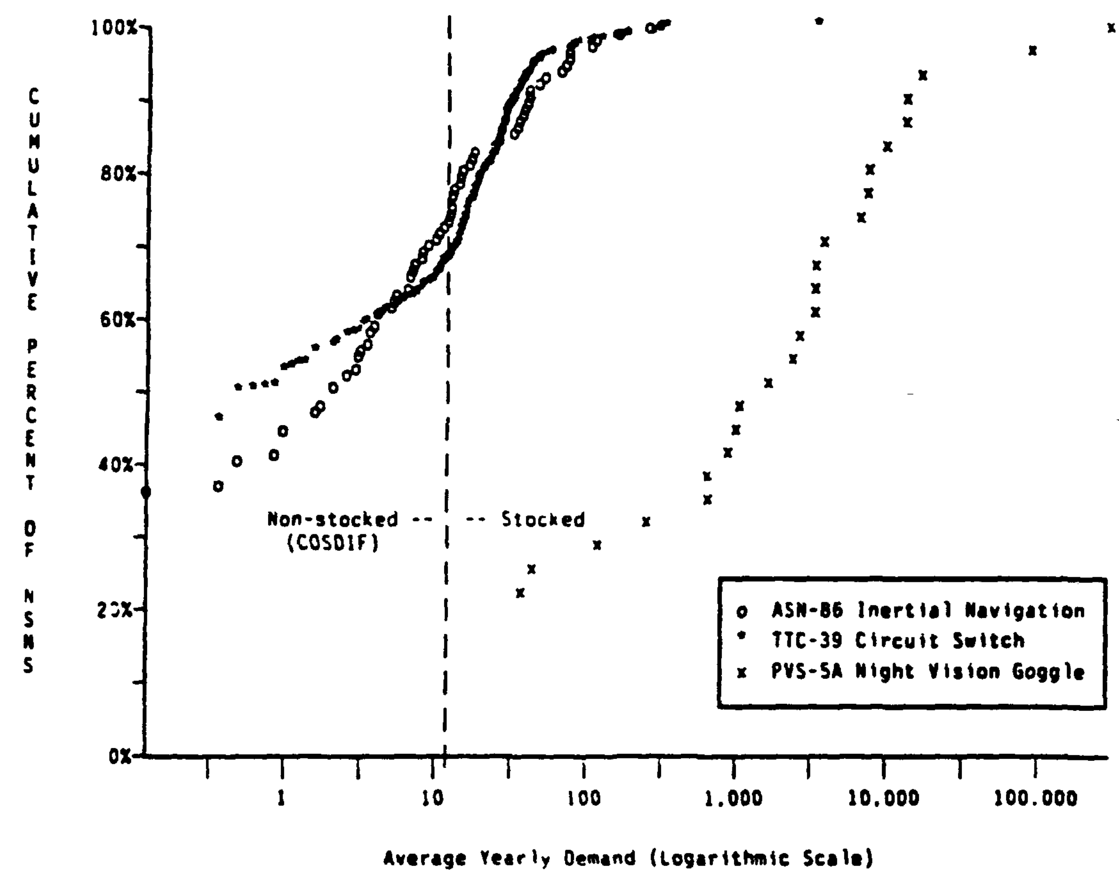
These two points are closely related, but we take them up in turn.

B.1(a) Stock/Nonstock Status

The first of these points is readily demonstrated. ***Figure IV-1*** on the next page shows the cumulative distribution of average yearly demand for three systems, including two of the sample low density systems (ASN-86 and TTC-39) and the high density PVS-5A night vision goggle (deployment roughly 32,000

systems). Because the range of demands is so great we have plotted the demand axis (horizontal) on a logarithmic scale. The vertical axis is the cumulative percent of CECOM-managed items (NSNs) whose annual demand is less than each value on the horizontal axis; for example, looking at the dashed vertical line at twelve demands per year, we find that about 75 percent of ASN-86 and TTC-39 NSNs have fewer than twelve average yearly demands, while only about twenty percent of PVS-5A NSNs have demands this low.

Figure IV-1. Average Yearly Demand: Cumulative Distribution for Selected Systems



The dashed vertical line at twelve demands per year is especially important, because above this level most NSNs of interest will be automatically classed as "stocked" by CCSS, while below this level they are subject to periodic scrutiny. In particular, an annual Cost Differential Analysis ("COSDIF") is performed automatically in accordance with *AR 710-1*, as described in CCSS documentation (*CCSSOI 18-710-102, Vol. 3, Appendix A*): an estimate is made by CCSS of the relative cost/benefit of stockage *vs.* nonstockage of the low demand items, and item migration is recommended on the basis of the result.

What is most striking about the graph is that most of the low density system spares fall within the COSDIF region, while nearly all the high density spares fall well above the COSDIF region. Specific numbers of COSDIF NSNs are:

- 73 percent of ASN-86 NSNs,
- 68 percent of TTC-39 NSNs, and
- 19 percent of PVS-5A NSNs.

As a result, CCSS will attempt to drop many or most of the low density NSNs from stockage, on the basis of low demand forecast (a recent CCSS change will make some of them insurance-stocked). Because of the importance of the low density systems, Item Managers frequently intervene to prevent this migration, freezing Item Management Codes to keep them stocked, freezing Study Method Codes to keep them reviewed, and freezing Average Monthly Demands with their estimates of future requisitioning volume.

B.1(b) Management Formulas

The second point made above -- that the overall low demand characteristic of low density systems challenges item management formulas -- is a complex issue outside the scope of this effort. Nonetheless, there are enough reasons for concern that the issue merits further analysis in its own right. We raise some of those issues here in the interest of prompting further study; they are all rather technical and will require detailed review of CCSS logic and formulas applied to specific low density systems and their component parts.

First, it is true of all inventory control systems in practice that the lower the demand rate of an item, the more difficult it is to forecast its future demand, to determine its economical inventory level, and to manage its timely resupply. In CCSS an NSN's average demand combines with its unit price to determine the forecast model used in its review (Low, Medium, High, and Very High Dollar review processes). For those NSNs in the sample systems that have passed the COSDIF screen (either automatically or manually), their generally high unit price compensates for their generally low demand rates to place the bulk of them into the medium-to-high dollar value category. This raises the question, Do the Medium and High Dollar Value processes adequately treat the low demand NSNs that form the bulk of low density system support requirements? A study by the US Army Inventory Research Office, *"Integrated Forecasting Techniques for Secondary Item Classes, Part II -- Inactive Items" (SEP 80, IRO Report #263)*, develops a special approach to low demand item forecasting that it concludes "may be fruitful." One of the principal improvements of the IRO approach may be simply that it separates "demand dollar value" and "demand quantity" as two distinct factors, rather than blurring the two together into a single measure; after all, the problem with forecasting low demand items is fundamentally one associated with the <u>quantity</u> of demand, irrespective of <u>dollar value</u>.

A second possible source of increased error could arise from the use of MDV and HDV capability for breaking demands down into separate customer areas, and separately forecasting within these areas; such disaggregation would seem to be undesirable in cases where demand quantities are low, regardless of the dollar value of those demands, and the LDV "Net Depot" approach to forecasting may be better. A detailed review of supply control studies appears warranted, along with review of the MMD files built for specific low density weapon systems; it appears possible to set MMD parameters to force the items of concern to be forecast by the "Net Depot" (LDV) study method.

A third concern is this: If an Item Manager has overridden a CCSS nonstockage recommendation and frozen a low demand NSN into the stocked category, how much automated support will CCSS provide in setting such levels as Requirements Objective and Reorder Point? (If CCSS demand tracking continues uninterrupted, and if stockage levels are automatically updated on the basis of such tracked data, then this concern would be allayed.)

The final concern in these technical issues is the establishment of wholesale requirements objectives for low density system support. As noted elsewhere in this chapter, the SESAME calculation is two-sided: on one hand it computes retail stockage requirements on the basis of collective contribution to weapon system readiness (operational availability); on the other hand it computes wholesale stockage requirements purely on the basis of average demand, with no regard for weapon system readiness or logistic down times. SESAME assumes a certain level of requisition fill for all items at the wholesale level (CECOM normally assumes 85 percent when running SESAME), but never performs the calculation required to ensure that such a level is achieved. When the bulk of items experience as few annual demands as are seen in the sample systems, this perspective on wholesale requirements is inadequate. Problems are compounded by the failure to consider procurement lead time in SESAME calculations at the wholesale level: one would expect that an NSN with a longer PROLT would receive a higher wholesale stockage by SESAME, both because the pipeline is longer and because the consequences on system down time are greater if the item is out of stock, yet these factors are not included. A fundamental improvement in both SESAME and CCSS calculations would be to compute wholesale ROs -- at least for low demand essential NSNs in low density critical weapon systems -- based on an objective depot response time. For example, set the RO for each TTC-39 NSN at a level which achieves an average 10-day depot time from receipt of requisition until release of materiel to the customer, and then track the achieved performance in practice. Instead, today's approach with SESAME is to assume an 85 percent requisition fill rate and assume a 120-day delay for unfilled requisitions, resulting in an assumed 18-day delay (15 percent of orders are delayed 120 days each) which is never tracked. Formulas for achieving this improvement to wholesale RO computation should be readily implemented in CCSS and SESAME.

B.1(c) Other Wholesale Issues

Finally, within this general area of wholesale-level concerns, we must include a variety of problems which are not directly related to low demand, but some of which are part of the "low density syndrome" discussed in *Chapter II*.

First, errors and gaps in the CCSS data base identified by CECOM in the course of this effort may amplify the need for intensive manual supply management for these systems. We believe that low demand effects cannot be conclusively quantified or corrected until such errors and gaps are corrected. Given the large number of low demand items whose data elements need review and verification if any large-scale improvement is to be gained, we can consider this a characteristic of high diversity in the low density syndrome.

Second, some of the wholesale intensive management requirement is a combination of low demand, high diversity, and high visibility factors, as follows. Each Item Manager has a diverse portfolio of many (perhaps 600) individually low demand items. Individual actions (requisitions, issues, repairs, procure-

ments) for each such item arise infrequently, and in low individual quantities; this combination of low demand and high diversity increases the "overhead" associated with the human aspects of item management, since the fixed costs/times of review and action are concentrated in smaller quantities. But, by the same token, each such action has a greater impact on supply status of low demand than high demand items (*e.g.*, in the extreme case of a stockage objective of one, each issue of a low demand item would be 100% of the objective; while each issue of a high demand item could be a tiny fraction of the objective). In the same way, the impact of each erroneous action is visibly magnified for low demand items (*e.g.*, over-procurement by one or two each may result in years of excess assets, while under-procurement of the same amount may result in prolonged system downtime). This magnified impact and heightened visibility increase the pressure to apply intensive management attention to these items.

B.2 RETAIL INTENSIVE ITEM MANAGEMENT

The most common concern in low density system support expressed by system users and retail-level maintainers was the difficulty of obtaining supply from the wholesale level, both initial and replenishment spares and repair parts, and the resulting need for intensive item management. At most user organizations we visited, experience of long backorders and lost requisitions has led to a climate of near-automatic expediting and follow-up, though users believe CECOM to be no worse in this regard than any other source of supply.

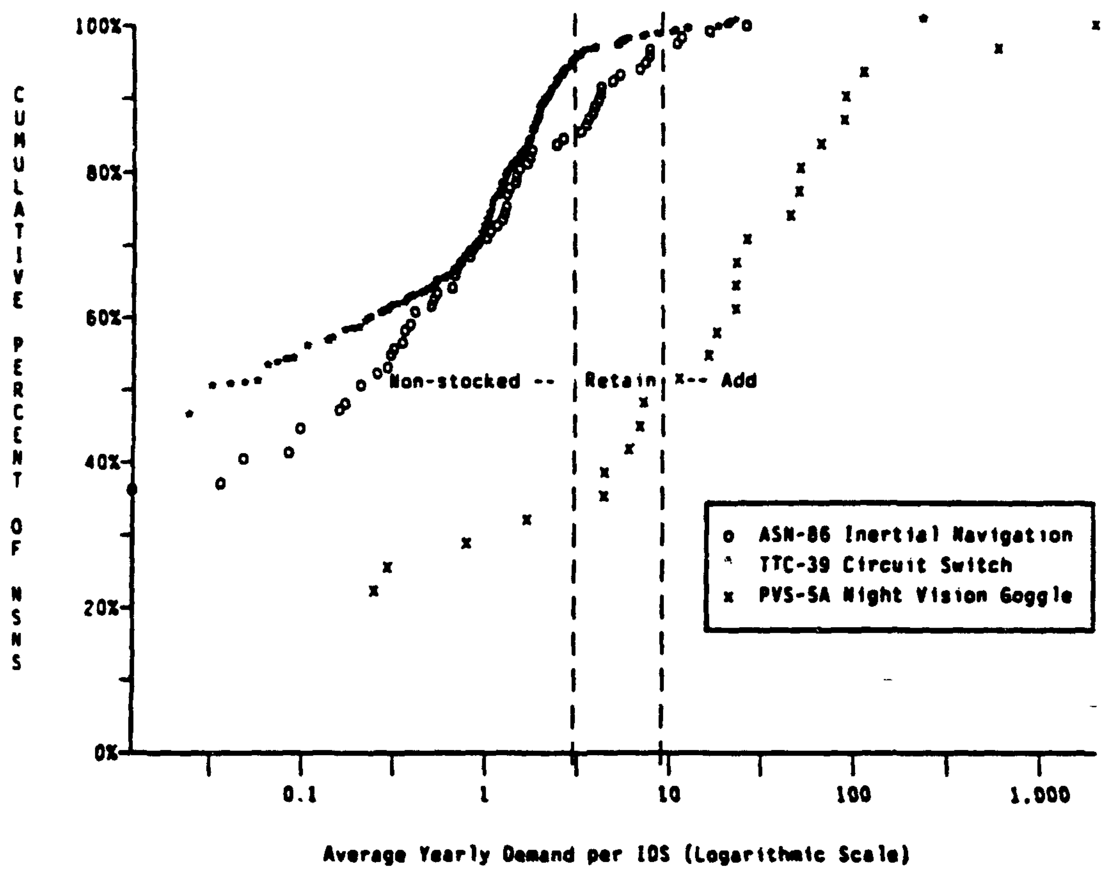
Fixes which improve wholesale supply availability should help to lessen the need for such intensive management of supply at the retail level, particularly as most of the effort seems to be spent in reacting to resupply delays. However, a number of distinct problems at the retail level must be addressed independently of any improvement in the wholesale supply situation.

First, the principal characteristic of low density system supply at the retail level is that it is almost totally nondemand-supportable; that is, practically none of the essential NSNs of such systems will experience enough recurring demands to qualify for stockage by the demand-support criteria of *AR 710-1*. This point is readily shown by ***Figure IV-2*** at the top of the next page. It shows the same set of low and high density systems as in the previous wholesale discussion, but here we see it from the perspective of the average Supply Support Activity at the IDS level.

Again the horizontal axis shows annual demand rates on a logarithmic scale, in order to cover the wide range of demand rates; and the vertical axis shows the cumulative percent of retail remove/replace NSNs whose annual demand is less than each level on the horizontal axis. The vertical dashed lines are drawn at three and nine annual demands: the demand-stock criterion is nine annual demands to add and three to retain an item.

The table below the graph shows the number and percent of essential NSNs that would qualify for addition and retention at the IDS level for each of the systems on the graph. Clearly, the low density systems would have very little ASL/PLL if only demand criteria were applied, and certainly far less than is held today at unit and IDS levels. Moreover, those NSNs which were demand-stocked would cover a much lower proportion of the low density weapon system

Figure IV-2. Average Yearly Demand per IDS
Cumulative Distribution for Selected Systems



Weapon System	Essential NSNs	Qualify to Add NSNs	Qualify to Add Percent	Qualify to Retain NSNs	Qualify to Retain Percent
ASN-86	57	4	3%	18	15%
TTC-39	215	10	2%	27	5%
PVS-5A	33	16	52%	21	68%

demands th..n is required, because there are so many low demand NSNs that would not qualify; for example, though not shown in the table above, only 37 percent of ASN-86 demands and 55 percent of TTC-39 demands are covered by their add-qualified NSNs (at least nine annual demands), but 99 percent of PVS-5 parts demands are covered by add-qualified NSNs. <u>Because the nondemand-stocked NSNs cover a high proportion of low density system supply actions, such systems require an alternative basis for stockage below the depot level.</u> It is for just this reason that OSD, DA, and AMC all approve approaches to retail

sparing of low density systems that go beyond purely economical demand-support stockage considerations and focus on weapon system readiness goals.

Having demonstrated the special nature of low density system supply at the retail level, we turn now to the particular elements of intensive management found at the user and intermediate echelons.

B.2(a) User Echelon

Requisition follow-up and deadlined system status review are the principal ways in which intensive supply management appears at the user level. Typically, users task the CECOM LARs with requisition follow-up action; whether the particular LAR is formally a maintenance or a supply specialist seems not to be considered. In cases where contractors are available to help in on- and off-equipment maintenance, the CECOM LAR loses the maintenance role at the same time he picks up the supply expediting role; in ***Section IV.C.1*** we shall return to examine the negative consequences of this on the LAR's usefulness.

In some units, low density sample systems are subjected to daily command-level status review; the TTC/TYC-39 in the 50th Signal Battalion is a case in point, where the focus of attention and follow-up action is on deadlined equipment that is awaiting parts from the wholesale system.

The urgency of retail resupply is magnified by shortfalls in the range and depth of retail stockage, making more requisitions high priority NMCS (Not Mission Capable, Supply) rather than low priority inventory resupply. These shortfalls result from a combination of provisioning and resupply problems, and are important enough to warrant separate discussions in ***Sections B.4-B.5*** of this chapter.

Another aspect of intensive management is that practically all retail stockage for the sample systems is manually controlled at present; however, this is a characteristic of the units and not of the low density systems. Although it places a burden on the using unit, having all retail supply for these items manually managed may be an advantage, because it thereby avoids the periodic stock/nonstock review found in automated systems.

Since the sample systems included only items found in MI and Signal Units, almost all their retail stockage appears as PLL organic to the using unit, though it is variously called "ASL", "PLL", or "Shop Stock" by the troops. In these low density cases, higher-echelon supply support activities (SSA) act only as requisition pass-through agents, rather than as sources of supply to the units. This is not itself a problem, but it seems to generate concern in the field that supply is "nonstandard" for these systems, as well as to make using units more dependent on good supply lines from CONUS and IGS/SRA repair sites as their only source of resupply. In some cases, SSAs are attempting to build ASL umbrellas for low demand PLL items, to the detriment of CECOM supply status and requisition fill.

One final user-level intensive management issue concerns the class of supply assigned to spare items. In particular, we found user concerns with the added human effort needed to manage LRUs for the ASN-86 as Class II property-book-accountable items, rather than as Class IX spare parts. While recognizing the

high cost of these LRUs, the users interviewed believe that this extra management is not necessary, and some have requested a change back to Class IX.

B.2(b) Intermediate Echelon

At the intermediate echelon a few intensive-management concerns have surfaced. First, an apparent conflict between ARI coding and TPS fielding is addressed later in the *Maintenance* section of this chapter, and is noted here because it presents aspects both of supply and of maintenance. Refer to *Section IV.C.5* for a complete discussion of the findings.

A concern voiced in USAREUR is a reluctance to move from Direct Exchange (DX) to the Reparables Exchange (RX) concept. The principal USAREUR argument against RX appears to be the belief that the retrograde time between IDS and the theater repair facilities will be significantly increased as a result of on-line supply system processing, rather than the current off-line maintenance system processing. Only two of the sample systems (the TRITAC switches and TACJAM) would be impacted in the short term, since the others have little or no in-theater repair above the unit level. It is true that TRITAC and TACJAM rely upon quick turnaround of theater-level repairs to compensate for short supplies, and any large time increases would hurt.

One final concern of intensive management at the intermediate echelon is in the area of unserviceable returns management. In many cases of short supply, field units report that CECOM will not fill a requisition until it has evidence of a turn-in from the same user. Since practically no SSA stockage is carried for these low density systems, essentially all requisitions carry the using unit's identifier, while all turn-in documents carry the (different) SSA's unit identifier; this makes CECOM's matchup of returns and requisitions a difficult task. Users say that they often experience long delays and much follow-up action in getting requisitions filled because a CECOM Item Manager cannot confirm documentation of their unserviceable return. One of the strong arguments presented in favor of the RX program is that it is supposed to move the task of policing the unserviceable returns process down to the IDS level, resulting in a concurrent requisition and turn-in; if this is the case, it should alleviate the problem, provided it does not -- as some fear -- add another delay node in the pipeline between the user and the depot.

Some locations recounted experiences of CECOM not filling a requisition until the returned asset was physically received in a CONUS depot. Apparently such a case is possible when units (some USAISC GSC-52 sites, for example) pass turn-ins through a DS4 computer, which is unable to deal with the special requirements of ARI processing; as a result, the CECOM Item Manager does not get the automatic AUTODIN documentation of a return at the point of turn-in, but only when the item appears on the depot records some time later.

B.3 PROCUREMENT/REPROCUREMENT OF SPARES

Both CECOM and PM Offices cited various concerns with spare parts procurement

- Reprocurement of some items has become impossible, as a result of technological change (*e.g.*, the paper-tape reader on IGR-V);

- Reprocurement of some items is made more difficult by virtue of low order quantities and competitive procurement combined, resulting in fewer potential suppliers considering a bid as worth their while;
- Reprocurement time for most items has lengthened as a result of CICA competition rules, which require individual Justification and Approval (J&A) for each noncompetitive action;
- Competitive procurement time is further lengthened, at least for the first breakout action, in cases where complete technical data packages (TDPs) were not acquired from the prime contractor, in the interest of saving up-front ILS dollars.

There is a low density syndrome aspect to each of these issues. First, with regard to technological change, the low demand for individual spares (like the paper-tape reader) reduces the importance of the Army to the marketplace; when technology advances, and both the manufacturer and the rest of the marketplace move with it, there is thus little economic reason for manufacturers to continue making residual quantities for just the Army. If the Army were a high demand customer of the item, it would likely have both a greater impact on keeping the older version available and on shaping the development and integration of newer technology. Thus, low demand magnifies (but doesn't create) a problem. If life-of-type procurement is ever justified, these low density system cases should be the ones for which it is most appropriate.

The second issue, concerning the dwindling pool of suppliers, is also one that is magnified by low demand. Low order quantities are characteristic of low demand items in their replenishment phase, and the cost to industry of preparing a bid for such low quantities is already high. The bid cost is further raised by the competitive procurement process, which (a) demands more time and effort and (b) is not linked to the likelihood of repeat multi-year business. While every high density system probably has some low demand items which have this problem, there may be enough high demand spares included in the package to make response worthwhile overall to qualified bidders; in the case of low density systems, however, it is likely that all spares will fall into the uneconomical-bid category.

The issue of increased lead time associated with preparation of J&As is not itself a low density problem. However, it is possible that low demand items, with low dollar-value associated, may receive lower priority in practice as they proceed through the J&A process, with priority attention given to the high-ticket procurements. As importantly, the effect of longer procurement lead times on low demand items is greater than on high demand items, due to the higher relative demand variability associated with low demand spares than with high demand spares. Competitive procurement of low demand essential spares may rightly be challenged on this basis.

The last concern cited -- the unavailability of TDPs and consequent longer procurement lead time -- is not unique to low density systems. However, as suggested in the discussion of *Section II.B.1*, the lower the system acquisition quantity the more pressure there may be to reduce such up-front ILS costs as the TDP. While this initial decision, and its associated commitment to sole-source procurement for the life of a low density weapon system, may have made sense at the time, subsequent CICA pressures may have invalidated some of the assumptions on which the decision was based.

B.4 SPARES RANGE AND DEPTH

At both retail and wholesale levels, there has been consistent concern voiced with regard to the range and depth of spares stockage, during both initial issue and replenishment phases. A variety of findings fall into this class:

- Many field-replaceable components are not considered maintenance significant ("P-coded") and are not provisioned or catalogued, while other components are provisioned but receive less attention once the pressure of initial fieldings is removed;
- Retail stockage decisions on range and depth are made almost entirely by Project Management Organizations, are developed off-line using engineering judgment rather than formal DA-approved supply models, leave no audit trail for review purposes, and may not be fully integrated into the budget process;
- Field elements rarely modify their PLLs for the sample systems from the initial issue levels, though they almost uniformly express concern over shortfalls in both range and depth; and
- Post-provisioning analysis and adjustment has not been accomplished by the C/E Community for any of the sample systems.

There is a low density syndrome aspect to some of these findings, either in terms of contributing factors or in terms of amplified impact on low density systems. Each of the above findings is amplified in the following paragraphs.

In addition, practically all of the retail stockage supporting the sample systems is nondemand-supported, yet none of the support packages was fielded with any formal ERPSL or MPL authorization for such support. This topic is so important and complex that we address it separately, in *Section II.B.6*.

B.4(a) Provisioning Item Selection

During Initial Provisioning of most complex low density systems, there are too many technical data lines submitted in the prime contractor's PPL to be thoroughly reviewed in the little time available. Instead, CECOM supply management attention tends to focus on those lines identified as "maintenance significant" by Maintenance Engineers and Equipment Specialists. Once this maintenance engineering decision is made, any line considered non-maintenance-significant receives no further attention from cataloging or provisioning. The only action taken for its supply is likely to be much later, and triggered by a part-numbered requisition from the field; if the Item Manager can then identify the part number and procure it, and if this occurs often enough, the item may eventually be moved into the maintenance-significant category and catalogued.

The table at the top of the next page shows the number of provisioning lines (PLISNs) classified as removed/replaced at retail echelons (Unit through IGS) in each of the sample low density systems as of March 1988. Also shown are the PLISNs which are not classed as maintenance significant, both in number and as a percent of the total retail PLISNs. For comparison we have included the high density PVS-5A night vision goggle (data as of March 1986); at 45 percent of retail lines not maintenance significant, the PVS-5A is not much different from the low density sample systems, though the absolute magnitude of the numbers of lines is quite large.

Weapon System	Retail PLISNs	Not Maintenance Significant PLISNs	Percent
ASN-86	1,180	583	49%
GSC-52	12,938	3,708	29%
IGR-V	43,830	16,610	38%
MLQ-34	8,694	2,393	28%
TACSAT	13,635	4,983	37%
IRITAC	38,887	14,325	37%
Total	119,164	42,602	36%
PVS-5A	181	82	45%

Thus, the narrowing of provisioning focus is clearly not unique to low density systems. However, with more than 32,000 goggles deployed, real-world maintenance significance should quickly become apparent as field requisitions arise to highlight catalog and provisioning oversights. In contrast, the low density systems have so many PLISNs with extremely low forecast demand rates that it is unlikely that any but the most egregious oversights in item selection will be caught as a result of recurring field actions.

The item selection process is further complicated by the incremental approach to provisioning, driven by the large number of PLISNs in these systems. In six sample systems alone there are already almost 200 thousand PLISNs, as shown in the first column ("Total") in the table below.

Weapon System	Total PLISNs	Retail PLISNs	Retail M-S PLISNs	Retail M-S Percent
ASN-86	4,878	1,180	597	12%
GSC-52	13,026	12,938	9,230	71%
IGR-V	71,219	43,830	27,220	38%
MLQ-34	14,794	8,694	6,301	43%
TACSAT	27,798	13,635	8,652	31%
IRITAC	65,503	38,887	24,562	37%
Total	197,218	119,164	76,562	39%
PVS-5A	254	181	99	39%

In order to have contractor data submitted and Army processing completed in time to meet initial fielding schedules, provisioning parts list (PPL) data is normally submitted and processed in at least two waves: the first wave is a short-form PPL, normally including just the significant field-level PLISNs to allow for cataloging and provisioning of retail initial issue and replenishment; the second is the full top-down breakdown of the items. The table above shows the short-form candidates in the column headed "Retail M-S PLISNs"; the percent of total PLISNs represented by these retail M-S lines appears in the last column, and ranges from 12 to 71 percent of the low density system population. The overall low density population average of 39 percent is the same as is found for the high density PVS-5 goggle. Again there appears to be no special treatment given to item selection for low density systems.

Even within this smaller population of retail M-S items, up-front errors are likely to be perpetuated once attention shifts to the next weapon system entering the provisioning process, leaving this system's provisioning incomplete. In terms of the low density syndrome discussed in ***Chapter II***, this is a case of diversity -- too many lines in too many systems to give any one all the attention it needs -- combined with the visibility of all the new systems competing for provisioning manpower.

Furthermore, when the full PPL comes in a year or more later with its typically large number of lines, the pressure of fielding is likely to have been relieved for this system and shifted to the next weapon system entering the short-form provisioning process. Again the likely result is incomplete provisioning.

B.4(b) Initial ASL/PLL Determination

Although the formal cataloging and provisioning of these systems was conducted under the direction of CECOM, the selection of items for retail stockage (ASL and PLL) was performed off-line by PM Offices. A combination of approaches -- most involving significant applications of engineering judgment and rules of thumb -- resulted in the PM's recommended ASL/PLL and FYDP spares budget, though not necessarily consistent with each other. In no case did we find SESAME modeling used as the basis of such requirements; on the contrary, in every case (except the ASN-86, which was fielded before SESAME was created) the C/E Community organizational consensus was "SESAME calculated no requirements" or "The SESAME results weren't believed, so we used our own spares estimates."

However, in no case were either CECOM or PMO personnel able to locate any SESAME run by which either budgets or ASL/PLL computations were attempted. This lack of audit trail makes it impossible for us to assess the validity of the anti-SESAME sentiments expressed. Nonetheless, on the basis of our experience with the SESAME model, we find it inconceivable that it would fail to compute any retail requirements for these systems, if properly run. Moreover, if SESAME results are not believed in specific cases, we would first question the inputs for those particular runs before questioning the validity of results alone. We shall return to this point in ***Section II.B.6*** below, in the context of MPL and ERPSL policy and implementation.

Thus, PM-approved ASL/PLL is prepared off-line, while CCSS data has little or no impact on initial sparing of CECOM items. There are no procedures to merge the two data bases, and so CCSS database errors and omissions are perpetuated. Moreover, any candidate spare not contained in the PM's offline ASL/PLL recommendation will probably have had no procurement during the provisioning process, because standard CCSS routines (ARCSIP and RDES) will not likely have been run or acted upon for the broader item population; even though these CCSS processes rarely compute any requirements on their own in low density cases, they are still required for establishing a variety of logistic data elements and recording support from other services and DLA.

When the first demand arises from the field for such an unprovisioned item, it is not on the ASL/PLL and not in the wholesale inventory, and so the weapon remains down until the wholesale supply system can react in emergency mode.

Finally, because of long lead times involved in the spares budget process, a radical change in sparing concept may not be implementable without a delay in fielding. Such was the case with TACSAT, where FOE resulted in a large increase in retail spares requirements: the Army solution was a combination of delayed, partial, and unofficial fieldings; $17 million increase in spares budget authority; an ASL/PLL concept disjoint from stated user requirements; and continued shortfalls in initial issue spares. Similarly, major reductions in PLL for the product-improved TTC-39A appear to have resulted as much from spares budget shortfalls as from problems in running the SESAME model.

B.4(c) ASL/PLL Changes

MI and Signal units we visited all have predominantly organic supply support: the role of their higher-echelon SSAs for these low density systems is almost entirely limited to pass-through requisition activity. The organic supply is variously called "PLL", "ASL/PLL", and "Shop Stock". In no case was unit-level stock reviewed by a higher-echelon activity other than on the unit's own initiative, and in no case did a unit report any IG inspection or concern, despite the uniform lack of any special nondemand stockage authorization.

Units were nearly unanimous in citing the problem that PLL range and depth are inadequate to support their mission. In fact, this is the concern most consistently cited by soldiers as central to the support of low density systems. In some cases this problem was expressed as a supply issue: "Demands are high enough that a certain item should have been on the PLL but wasn't, or should now be added to the PLL but can't, or should be available from the depot but isn't." In other cases it is expressed as a maintenance concern: "The maintenance concept requires board-swapping to fault-isolate in certain ambiguity cases, but not all of the boards (or other item) are available." [In another, more questionable form, the maintainer says, "We have CCAs #1 and #3 spared, so we think we should have #2 also", without any consideration of fault isolation requirements.]

Nonetheless, there was surprisingly little change made to any PLL by the field units: in some cases, the initial fielding PLL remains the one in effect four years later. Despite vocal concern there was little evidence of field action taken to change the situation; in some cases, user-level initiatives were quelled at higher echelons. Four examples illustrate the range of activity:

- The 1st MI Battalion didn't take action to increase range/depth of such critical IGR-V spares as the dipole antenna because "the supply system won't allow it, and there aren't enough spares to go around anyway";
- The 93d Signal Brigade is processing a formal change to its TTC/TYC-39 PLL for command-wide adoption, an initiative which appears to be a reaction to the drastic reduction in PLL lines fielded with the TTC-39A as compared with the older TTC-39;
- The 7th Signal Brigade has made a similar request to 5th Signal Command for local "MPL" status of its TTC-39A/TYC-39 PLL; but while the higher headquarters has approved each Battalion's PLL individually, it has rejected the blanket MPL request; and
- Units in Korea were in the process of updating and adjusting their PLL/ERPSL; there was no indication that higher echelons had encouraged or discouraged their initiative.

This reflects a climate of discouragement among users, where the only formal action taken to upgrade PLLs seems to stem from a desire to protect existing levels against cutbacks rather than actively to improve them.

B.4(d) Post-Provisioning

None of the sample systems has had any formal post-provisioning review. While this study effort can only scratch the surface of wholesale and retail status, enough problems have been identified and reported in the preceding *Assessment* chapter to indicate the need to conduct such reviews, both to update spares lists and to provide real-world input to COEA efforts.

B.5 SHORTFALL IN INITIAL ISSUE *vs.* PLAN

The discussion in the preceding section concerned target stockage range and depth at the retail level. In addition, several units reported serious shortages in actual quantities distributed against those targets in the initial fill process. In some cases these reports were accurate, but in others it turned out that initial distribution was close to 100 percent of the authorized lines; that is, the unit had received most or all of the quantities which were identified as "ASL" or "PLL" by the Materiel Fielding Plans. For example, one unit said "Initial issue of TTC-39A spares were short many of the authorized 40 NSNs", but a subsequent check of the records indicated 98% fill. It appears to be one of several cases where perception and fact diverge.

The perception is magnified by the gaining command policy that 100 percent of essential ASL/PLL lines must be available at the time of new equipment handoff. Thus, shortage of even one line in the PLL against target can raise a red flag. However, this policy should perhaps be strengthened, in the light of known gaps in development of the PLL/ASL (*Paragraph IV.B.4* above).

B.6 STOCKAGE AUTHORIZATION POLICIES AND PRACTICES

In the course of this study the team found a great deal of confusion abroad concerning the authorization of stockage below depot:

- What stockage is authorized?
- What is that stockage called?
- How is it determined, reviewed, maintained, and changed?

On the one hand, official policy is changing: *AR 710-2* has dropped reference to ERPSL, and DA DCSLOG policy is currently focused on MPL. On the other hand, strict compliance with either policy is almost impossible to find in practice for the low density sample systems. In practice, few of sample systems in the MI or Signal Units visited appears subject to any higher-echelon oversight of PLL, none has any control exercised by standard automated stock control systems, none has been authorized MPL, and only TACSAT units have been authorized to stock ERPSL. Most retail stockage for these systems is maintained on the basis of initial guidance from CECOM and the Project Managers at the time of fielding.

There is thus a clear disconnect between evolving policy and current practice in low density weapon system support, made possible by the relative autonomy

of MI and Signal units in the management of retail spares assets. If the standard system (*AR 710-2, etc.*) were to be enforced down through all the echelons and across all unit types, this disconnect would have serious and visible consequences on supply management for these systems.

This should be treated not just as an issue of formal authorization, but as a more serious disconnect between user/system logistic requirements and CECOM/PM stockage recommendations. There is a system-wide lack of discipline in supply planning and management today, as the following examples illustrate:

- Each of the sample systems has been fielded with predominantly non-demand-supported spares stockage, but none has been fielded with formal ERPSL or MPL authorization;
- After a string of past failures in attempts to get ERPSL approval, both PM Offices and CECOM stopped applying, believing that the ERPSL concept was dead long before its reference in *AR 710-2* was expunged;
- One sample system whose PM applied for ERPSL authorization from DA was recently approved, but only after initial fieldings were completed, and just before the word "ERPSL" was removed from the DA regulation;
- While ERPSL is no longer recognized in *AR 710-2*, it still appears throughout DA PAM 710-2-1;
- Though SESAME provides the capability to compute retail spares pipelines to meet required operational availability for these low density systems, none of the sample systems used it as the basis of ASL/PLL;
- We met few people in our visits to using/supporting units who understood what the MPL is or how it is to be tailored, even though lists and procedures have been published at least since 1985; and
- Of all the systems in the sample, only the TRITAC switches are on the MPDL (Mission Profile Development List), which is the first step towards MPL creation.

Many of these issues and problems are correctable by CECOM; others require elevation to higher headquarters.

B.6(a) SESAME Usage and Control

With nondemand-supported spares dominating the supply requirement for low density systems, the SESAME model must be used in budgeting and provisioning spares in support of materiel readiness objectives. In interviews with CECOM and PM Offices in the course of this study the comment was repeatedly made that either SESAME was never run or its results were not believed or used as the basis for provisioning. Since the SESAME model is apparently to be retained as the Army's chief low density provisioning and budgeting tool (with the MPL model starting two years after initial fielding), it is essential that CECOM ensure its proper use within the C/E Community. This includes several requirements and initiatives:

- Dedicate the necessary mix of disciplines to SESAME analysis;
- Improve documentation of the model for use by the C/E Community;
- Provide training and qualification within the C/E Community;
- Participate more actively in the budgeting and sparing processes;

- Institutionalize a permanent audit trail;
- Organize distribution of spares documentation to the field; and
- Expand sparing-to-availability concepts to include the wholesale level.

The following paragraphs amplify these points.

There seems to be a belief that SESAME is an automatic computational tool that doesn't require much attention to its use: this is far from the truth. In fact, "sparing-to-availability" is a complex task for which intuition is no substitute for understanding of input/output and of the computational model, and for which no automatic answer can ever be accepted until it has been reviewed and comprehended by both engineers and logisticians. As we noted earlier, it is virtually impossible for SESAME to "compute zeroes", as many have claimed has happened; likewise, it is practically guaranteed to produce errors if it is fed bad or incomplete input data by untrained users, as appears in some cases. The proper use of SESAME requires a broad engineering-maintenance-supply perspective, which cannot ever be completely automated.

Documentation of the SESAME model needs to be simplified and tailored to the CECOM base of systems and units supported. At present the only documentation is *DARCOM PAM 700-18*, a 136-page "users guide" for the mainframe version that has more information than most users are likely to require or understand. At the same time, there is no documentation of the more commonly used personal computer version of the model, despite differences between input data layouts. SESAME users need a simplified set of instructions that focus on just the relevant operating requirements, and that explain both (a) how to interpret and implement the good results and (b) how to recognize and correct anomalous results when they occur. At the same time, improved PC-based data entry and edit routines should be developed both to simplify data management and to catch errors before processing.

Training in SESAME's use is at present inconsistent, and some individuals are running the model and reporting its results without ever having been trained properly, if at all. While courses are periodically offered and DMM personnel trained, and while CECOM assistance is available to PM Offices and others on request, there is no requirement that any model user either take such a course or demonstrate any proficiency in the modeling.

There seem to be two opposite points of view with regard to initial sparing: on the one hand, PM Offices appear to believe that only they have enough knowledge about their particular weapon systems to decide what needs to be spared; on the other, CECOM is treating the process as an automated mathematical computation. The real requirement is for a combination of both disciplines, along with contributions from maintenance specialists and operational doctrine experts. In short, there needs to be an awareness in the C/E Community that SESAME is just one part of an extremely difficult and expert-intensive technical process that requires more than just engineering gut feel and more than just running numbers through a calculator.

In addition to resolving the SESAME computational problem, there is the need to build a permanent audit trail of formal spares planning documentation for each weapon system. For all of the sample systems, no one attending the CECOM or PMO meetings could produce any set of computations on which any ASL or PLL

for the sample systems was based (or runs which were rejected as having "all zeroes"), nor is there any permanent and consolidated library of such supply documentation as materiel fielding plans, ASL/PLL listings, spares budget backup, or post-provisioning reviews. Each of the sample systems is spared in a vacuum using its own approach to range/depth determination and its own concept of how the Army works, and then each PM broadcasts the results to the field in a different form. A central library of data and documentation would help discipline the process, by providing both an audit trail and a source of latest versions of each supply product broadcast to the field.

Finally, as noted in *Section II.B.1* above, we believe that part of CECOM's item management problem for low density systems is traceable to a lack of any sparing-to-availability perspective at the wholesale echelon. This gap begins with SESAME, which treats the wholesale echelon by a purely demand-supported calculation, and continues with the CCSS item management logic. This is an area which should be examined by the US Army Inventory Research Office, and CECOM should take the initiative to prompt such efforts.

All of these findings with regard to SESAME will apply equally to the MPL process, which is the subject of the next subsection.

B.6(b) The MPL Process: Policy and Practice

Army policy and procedures on nondemand-supported stockage at the retail level have undergone major change in the past few years, as the ERPSL concept has fallen out of favor and the MPL concept has gained in acceptance. As documented in *AR 710-2* and expressed to us by DCSLOG personnel, ERPSL is no longer recognized by them as a valid support concept for low density systems. At the same time, there seems to be a general sense in the C/E Community that MPL is just another name for ERPSL: this is not true, as both policies and procedures are quite different. In this section we shall highlight the differences which appear to offer the potential for the greatest impact on CECOM's low density system support.

Since none of the sample low density systems has an MPL yet, this discussion is necessarily somewhat theoretical; it is based on discussions with DCSLOG, Army Inventory Research Office (IRO), the C/E Community, and MRSA; reviews of Army policy and draft procedures; and analysis of data from CCSS, MRSA, and IRO. Nonetheless, given the Army-wide movement towards MPL as the central low density system support vehicle, the discussion is likely to be relevant to all C/E systems in the future.

First we should clarify the term "MPL". The Mandatory Parts List is a DA list of NSNs which must be stocked by units that use the particular weapon systems on the list. For example, if a particular Signal Battalion has six AN/XYZ-1 systems on its property book, then the unit must look up the AN/XYZ-1 on the MPL, find the table column headed "six", and stock each NSN in the quantity shown in that column of the AN/XYZ-1 table. While there are actions underway to simplify and consolidate the process, this is still an accurate description of the policy at the user level.

So far, then, the MPL acts just like the ERPSL with respect to the using unit; in fact the MPL at this level offers certain weapon systems the potential for some improvement, through disciplining the process by which stockage range and

depth information is tailored to individual unit support densities and broadcast to the field.

It is at the intermediate echelon where the first difference is seen. The biggest difference with regard to policy is the requirement that Supply Support Activities at the IDS level are required to stock all NSNs appearing on MPLs of units supported: *AR 710-2 [paragraph 3-8b(4)]* says "These items will be added to the ASL when they appear on one or more customer MPLs or shop stock. They will be removed from the ASL when they are deleted from all customer MPLs or shop stock." In contrast, SESAME may assign some spares to the unit ERPSL that are not assigned to the IDS ERPSL; in some cases this may yield a higher readiness level with a given total spares investment. The difference can be quite large in situations where items appear on the ERPSL for purposes of fault isolation (SESAME "FIM" code "F"), or where there is just one Unit supported by each SSA (as in the case of IGR-V).

On the positive side, this "umbrella" aspect of MPL would provide a cushion that would make supply support more robust, by changing the SSA's role from pass-through requisition/turn-in agent into a true backup stockage point. On the other hand, with retail supply requirements potentially doubling in such low density cases as IGR-V, it is unlikely that such stockage would be funded in today's budget climate. A more likely outcome -- of which the narrowing of the TTC-39A support list may be indicative -- is that the range of PLL items will be narrowed to accommodate ASL umbrella coverage of the remaining PLL items within present funding limits. Were this the result, the relatively small number of ASL/PLL MPL lines would be overprotected, at the expense of keeping the majority of maintenance-significant items off the field stockage lists at any echelon.

We note in passing that the Army has tested and approved an "MPL-ASL" concept, with division-wide stockage range and depth tailored to the total equipment distribution in the Division. This presents a more complex computational problem for low density systems than that discussed above, but the conclusions with regard to impacts on readiness, cost, and the SSA's role still apply.

The remaining important differences between ERPSL and MPL relate mostly to the mathematics of computation and the organizational tasking of that computation. With ERPSL the principal organizational tasking is with the PM Office, whose initiative is supported by CECOM as required in running the SESAME model and in preparing the formal request to AMC and DA; once approval was granted, it generally devolved upon the PM Office to prepare the documentation broadcast to the field in whatever format seemed most appropriate. With MPL the tasking is dispersed among several organizations, each of which has some input into the process:

- TRADOC adds weapon systems to the Mission Profile Development List (MPDL) to identify them as MPL support candidates, and provides combat mission profile data as input to the MPL computational process;
- CECOM provides maintenance and supply data on candidate component parts of these weapon systems, for input to the MPL computational process;
- MRSA collates the inputs from TRADOC and CECOM (along with the other NICPs), verifies certain data elements against the AMDF, screens out some items that do not pass certain edit criteria, and sends the output to the next step in the process;

- The Army Inventory Research Office (USAIRO) runs the computational model based on the input provided by MRSA, and sends the resulting PLL range/depth numbers back to MRSA on tape;
- MRSA reviews the output and forwards to TAG for printing.

At various points in this process there are opportunities for human review of interim and final products, but there are massive volumes of data involved and it is not known how much effective review is exercised. For example, there are nearly 14,000 parts resident on CECOM's parts candidate file (CIF) at this time, even without any of the six sample systems included. With so much volume moving through the complex process described above, and with so many participants each contributing just a piece of the data or calculation, there appears to be little chance for performing the kind of sanity check that the process demands. We should repeat the comment made earlier with regard to the treatment of SESAME by CECOM, substituting the word "MPL": there needs to be an awareness in the C/E Community that MPL is just one part of an extremely difficult and expert-intensive technical process that requires more than just engineering gut feel and more than just running numbers through a calculator. The MPL process is at present no more capable of automation than SESAME; it must be tended just as carefully, even more so, if it is to produce any credible support for low density weapon systems.

There are some additional specific findings with respect to the MPL process that should be mentioned here.

First, the TRITAC switches are the only family to appear on the Mission Profile Development List out of all the six sample systems. [The MPDL appears in *DA PAM 710-2-1, Appendix J*.] While TACJAM was on prior editions of the MPDL, it no longer appears. Since the MPL policy exempts nontactical telecommunication systems, the GSC-52 would not have to be included; but the other sample systems would have to be added. Further action will thus require coordination with TRADOC for mission profile development.

Second, the MPL process at CECOM is in as much need of documentation and control as is SESAME, for essentially the same reasons. The problem with MPL is even greater, because the computational process is still not completely documented by the Army, and there is no formal guidance on item selection. In addition, widespread mistrust of PMR data on failure factors and other maintenance characteristics will continue to undermine confidence in CIF extract data on which the MPL calculations are based. This appears to be an Army-wide problem, not unique to the C/E Community; but the number of PMR lines in question combined with the number of low density systems may make the size of the corrective task greater at this Command.

Beyond this problem of data integrity in specific cases is a need for standard operating procedures to ensure that outbound extract data overall is complete and sensible, and that any outputs from upstream processing are completely reviewed by Project Management Offices before going to TAG for printing. CECOM is still allowed to review and modify the MPL, and it should not pass up the opportunity.

The final point of concern to CECOM is the need to ensure continuity between the provisioning and sustainment phases of support, and between budgeting and procurement and deployment of spares. This is not a new problem peculiar to

MPL: aspects of the problem were pointed out above in the SESAME discussion, with regard to disjointed actions taken by various activities in the C/E Community in the budget and requirements processes. But the opportunity for such discontinuity is increased with MPL, because it increases the number of computational methods into the process: in particular, it will leave SESAME in place as the up-front provisioning and budgeting tool, but will then use the MPL model as the "post-force-modernization" retail requirements tool. While the MPL model is based on SESAME, there are a number of areas where much different results are likely, including the following:

- The MPL model is run with a constant 10 percent NMCS constraint; SESAME is run with whatever Operational Availability target is specified in the ROC for each system.
- The MPL model decomposes the calculation into a PLL problem and an ASL problem, and bases the PLL on an assumed 95% IDS fill rate; SESAME does the calculations together, making no assumptions about IDS fill rates, which may be substantially more or less in particular cases.
- The MPL calculation assumes no resupply of the IDS in a combat environment; SESAME assumes continual resupply of IDS in a peacetime scenario.

We understand that no formal comparison has yet been made between MPL and SESAME, either in theory or in specific low density system cases; this should be a worthwhile exercise to serve as the basis for future budgeting plans. How one gets from one life-cycle stage to the next with a congruent set of assets is of central importance to C/E Community logistics management.

B.7 IMPACT OF MAINTENANCE ON SUPPLY

The last topic in the area of supply concerns the interaction of supply and maintenance problems with low density systems. From the perspective of supply the only effect to note is the effect of inadequate BIT/BITE and diagnostic aids on supply. [In *Section IV.C.5* we discuss additional impacts of supply on maintenance.] This is not a low density problem *per se*, but may reflect a combination of factors discussed in *Chapter II* as the low density syndrome.

The effect shows up to some degree in all of the sample low density systems. Whenever a fault diagnostic ambiguity arises, the simplest way to resolve it may be to swap LRUs (CCAs, modules, or other) until the system comes back up or the fault message changes. There are two results:

- Units try to stock all the LRUs in the ambiguity group, in hopes of covering every possible fault condition; one unit we visited is poised to drop such requisitions if his recommended PLL change is approved.
- Demands for LRUs in an ambiguity group can increase if the maintainers leave all trial-swapped parts in the end item and evacuate all plucked parts; conversely, if trial-swapped parts that don't bring the system up are presumed good and are returned to stock, the PLLs can be degraded by the presence of unserviceable cards.

Whether the workaround is driven by a shortfall in supply or maintenance, there is an additional tendency to use an available contractor to work around the problem, thereby helping to intensify the long-term dependence on outside help and postpone resolution of organic supply/maintenance.

C. MAINTENANCE

Five factors affect the quality of maintenance for the systems studied:

1. Personnel, including skill levels and availability;
2. BIT/BITE, including depth and completeness of coverage;
3. TMDE;
4. Documentation, including the maintenance concept; and
5. Repair parts, particularly the impact of supply on maintenance.

Each of these is treated in turn in the remainder of *Section IV.C.*

C.1 PERSONNEL

Four factors are characteristic of the logistic personnel posture observed in the sample systems:

- There are significant shortfalls between on-board strength and TOE or TDA authorizations;
- The scope of training in AIT for maintenance personnel (and to some degree for operator personnel as well) is not in sync with organic unit maintenance needs, resulting in excessive OJT programs that exacerbate the shortfall problem;
- The combination of these two factors serves to integrate contractor logistic support (CLS) deeply into the organic levels of maintenance: in the cases of IGR-V and ASN-86 the CLS involvement runs from operator through depot levels; and
- Availability of contractor support for the sample systems is relegating the traditional role of the LAR to one of supply expediter; this has been exacerbated by the provisions of *AR 700-4*.

Each of these factors merits attention in the following paragraphs.

C.1(a) Military Personnel - Quantity

The numbers of maintenance soldiers on hand in authorized positions are unsatisfactory for most of the low density sample systems, the GSC-52 and EUSA being the most notable exceptions. In one CEWI Battalion, MOS 33T (TACJAM) was authorized for thirteen positions; only one was assigned. In another unit with the same authorization, only five were assigned. MOS 33R (Guardrail and Quicklook) is in a similar position. In Europe, 29M repairmen for TACSAT (TSC-85/93) are short: in the 72d Signal Bn, five 29M are assigned to maintain sixteen terminals; in the four units visited in Europe, thirty-two of the authorized fifty-two 29Ms were on hand. There was a much higher fill of 31Q (TACSAT Operator), and these fills approacned 100% in Europe. In the case of the MOS 33 series, DA/DCSPER has acknowledged its inability to fill the authorized positions until 1991, which they estimate is a get-well date. Until then, DA recommends continuing contractor support to provide necessary maintenance.

In most of these MOSs an Additional Skill Identifier (ASI) ties the basic MOS to a specific system (*e.g.*, 35R-R5 is the ASN-86 Inertial Navigation Set maintenance MOS). The enlisted personnel management system distributes individuals by the three-digit - MOS, losing the skill identification in the process. The result is genera..y a mal-assignment *vs*. the ASI requirement.

In view of the shortage of experienced repairmen in the systems studied, one would expect a relatively large maintenance burden and backlog at IDS and IGS. Such was not the case, except for one CEWI Battalion in Europe. For example, at Fort Bragg the operator of the ATE equipment at GS (58th LEM) had no record of maintenance workload for the TRITAC switches. The work consisted mostly of testing spare boards, but he had no parts on hand to repair a PCB. This paradox appears to be the direct result of contractor presence at all levels of maintenance for the majority of systems studied. The observation is made that CLS is well entrenched for low density systems. One catalyst of this condition is the shortage of on-board soldier maintainers.

C.1(b) Military Personnel - Quality

The level of training problem is slightly more complex, but still fundamental in aspect. The maintenance MOSs graduate from AIT with reasonable training in component repair (*i.e.*, IGS-level maintenance). However, these graduates receive little or no system-specific training, such that when arriving at the unit they cannot exercise BIT/BITE, nor do they know how to turn on the system they are charged to maintain. When queried on this subject, the Signal School agreed that the condition exists. As an example, Fort Gordon observed that the training course for MOS 31Q (TACSAT operator) is not extensive enough for the operator to understand BIT/BITE on his system. The operator maintenance burden then falls on MOS 29M, already in short supply and itself requiring extensive OJT to convert the IGS training to an IDS capability. For AIT graduates assigned at IGS, AIT is deemed adequate; if assigned at IDS, OJT can take up to eighteen months to reach journeyman qualification, all the while affecting personnel mission availability and unit readiness. The effect of this problem is severe in Korea, where tour length is less than OJT requires.

Once a soldier is trained and competent in his selected system, he is given an Additional Skill Identifier (ASI), a two-letter digit indicator suffix to his PMOS. This would seem to be the necessary driver to insure he is assigned to his specialty. However, the Army's personnel management system does not use the ASI in projecting assignments. The result can be that scarce manpower is assigned to sites having none of the special low density systems on which they have been trained. For example, two aerial MI units with shortfalls against authorization reported instances of a 35R-R5 with ASN-86 training being assigned to another unit that has none of the systems. In one case at Hunter Army Airfield, an E-5 with formal Guardrail training was scheduled for assignment to a different unit than the 224th MI Bn; in his own words, "I had to fight to get here." Fort Bragg flatly states, "We can't remember receiving a 36L with prior experience on the -39 switches."

To obtain personnel trained to the ASI level, units must TDY their personnel back to the school, at unit expense, further aggravating the shortfall problem mentioned in the preceding paragraph.

One area of which all unit commanders speak highly is New Equipment Training. The courses are considered good, and instructors competent, and the study team found that the quality of maintenance is highest in those units in which factory-trained NET personnel are still on board. The implication is that as the system life cycle moves beyond the fielding date, the sharpness of maintenance skills will erode.

C.1(c) Reliance on Contractor Support

As with the shortage problem, the need for optimum OJT makes the unit heavily dependent on the contractor at the organizational level to provide or bolster its essential OJT effort. In one instance, a contract existed solely to provide unit-level OJT. It is evident to the study team that the personnel situation, both quantity and quality, catalyzes a greater unit dependence on contractor support.

C.1(d) The LAR's Role

One of the side effects of heavy reliance on contractor support is a reduction in the role of the LAR in the maintenance program. In part this is aided by the on-site availability of most contractor personnel, which makes them more accessible to the unit than a CECOM LAR, particularly in those cases where the LAR is stationed at some off-site location. As important as availability in this process is the quality of LAR training and support: the once-strong technical prowess of the CECOM LAR (formerly Field Maintenance Technician, or FMT) is eroding. While contractors provide specially trained field service representatives (FSR), the LARs go begging for technical update. While contractor FSRs come complete with TMDE, some of it proprietary, the LARs have virtually none.

The result of this combination of unit need for quick-response maintenance support, contractor support availability, and eroding LAR capability is the dilution -- or even erasure -- of a once highly responsive and valued resource. The LAR is being relegated to the role of parts expediter, calling into question the future of the LAR program.

To a degree, Army policy has contributed to the erosion of the LAR's role. The effect of *AR 700-4 ("Logistic Assistance Program")* was noted earlier as a perceived constraint on LAR effectiveness. This observation was made by more than one CECOM LAR in the course of discussions, and caused the study team to review both this policy and the related provisions of *AR 750-1 ("Army Materiel Maintenance Policies.")*

There are two related issues involved:

- As stated, CLS is elbowing the LAR away from his traditional support role. The longer on-site contractor maintenance is active, the less important the LAR becomes in providing maintenance support.
- The provisions of *AR 700-4*, specifically *Paragraph 2.4 ("Use of Logistics Assistance Personnel")*, are being interpreted as prohibiting active LAR involvement in maintenance support.

Paragraph 2.4 of *AR 700-4* states that logistics assistance personnel will not be used to "...do routine maintenance except as part of supervised instruction

or training." No such constraint is placed on contractor Field Service Representatives (FSRs); in fact, their contract task is to provide such hands-on support along with assistance in OJT. As stated, the effect of the *AR 700-4* policy is to relegate the LAR to a lesser supporting role. When coupled with an eroding technical skill level through lack of training, and a lack of current TMDE through failure to provide technically current resources, it is clear that policy is methodically destroying the utility of a once-significant field asset.

An apparent failure to comply with contract maintenance policy in the ARs cited amplifies this scenario. In particular, provisions of *AR 750-1* place certain constraints on contractor field maintenance:

- *Paragraph 3-24* limits contractor services to short-term tasks, pending attainment of organic capability; and
- *Paragraph 3-26* prohibits use of civilian maintenance personnel forward of the Corps rear boundary in contingency planning.

No evidence has been seen to suggest these policies are enforced for the sample systems. Thus, once in place, contractor maintenance appears to be self-perpetuating, with the analog result on LAR contribution to maintenance.

Paragraph 3.3 of *AR 700-4* limits the use of contractor FSRs to one year, pending approval by the Assistant Secretary of the Army (IL&FM). Simultaneously, using and providing commands are admonished to develop an in-house capability to support the equipment "as soon as possible." There is no evidence that the one-year limit is being enforced, but there is ample evidence that the development of organic capability is either not taking place at all or is not proceeding at the pace intended by the regulation.

At the bottom line, CECOM appears to be embarked, either consciously or unconsciously, on a path to destroy the FMT component of the LAR system. It is not clear at all whether this course of action is cost-effective. As a minimum, policy and implementation should be closely assessed.

C.1(e) Summary of Personnel Issues

Personnel problems impose a critical constraint on the maintenance mission. Significant personnel shortfalls (strengths at or below 50% of authorizations is the norm) and extensive in-unit OJT requirements for AIT graduates (12-18 months is the norm) decrement both ORG and IDS maintenance capability. For all systems evaluated, ORG and IDS levels of maintenance are organic to the host battalion. The immediate effect of this two-sided personnel problem is that contractor maintainers are called in to the battalion to bolster both levels of maintenance, and in some cases to conduct the requisite OJT. A secondary effect of this pattern is that the CECOM LAR is being steadily removed from the maintenance scene and called upon primarily to "chase requisitions," at the same time as the contractor solidifies his position in the long term. This is a manifestation of LAR inability to keep pace with advancing technology through training, and the impact of *AR 700-4*.

One exception to the technology/training gap is found in the GTE transfer-of-technology program for the TTC-39/TYC-39. This program is having significant impact on restoring the CECOM LAR to the role of an effective technical advisor to the unit.

The personnel problem is complex. Resolution will require the coordinated effort of all major headquarters involved in equipment acquisition: TRADOC on training, AMC on ILS and contractor support, and DA on Army policy with respect to the LAR program.

C.2 BIT/BITE

One of the most important design-for-supportability factors is the performance and contribution of BIT/BITE to maintenance and readiness. For the sample systems in the study this was also one of the most elusive factors to grasp. BIT/BITE evaluation by those interviewed was distorted by a combination of organizational and procedural factors:

- Each of the equipments reviewed is assigned either to a Signal organization or an IEW organization, whose Unit and Intermediate DS level maintenance responsibilities are organic to the battalion, with assigned organizational mechanics and equipment repairmen. The demarcation between their functions, and their individual adherence to the MAC, are frequently blurred. Thus, their evaluation of BIT capability, in terms of its alignment with the MAC and levels of maintenance authority, is blurred as well.
- In some instances (*e.g.*, IGR-V), Intermediate GS and some depot-level maintenance are also organic to the battalion, in most cases performed by contract. Contractor personnel are found to operate hand in glove with both organizational and IDS personnel, causing maintenance functions to become intermingled. There is, as a result, a blurring of maintenance allocation -- what level of maintenance, which individual at that level (civilian/contractor/soldier, and skill/grade level) -- as well as a blurring of BIT/BITE expectations.
- Equipment operators, normally using BIT/BITE to fault-isolate to LRU level for repair by replacement, can and do perform IDS and, in some cases (*e.g.*, TTC-39) IGS maintenance functions under these circumstances; in some cases such actions appear to be workarounds driven by shortages of supply, higher-echelon personnel, or other. Many of the school training courses do not train the Operator in the BIT/BITE function. Thus, when a soldier is asked to assess BIT/BITE effectiveness, it is often unclear from which level of maintenance he is viewing the question -- Unit, IDS, or even IGS. And because BIT/BITE is generally not designed to support IDS or IGS, BIT/BITE and diagnostic workarounds become associated in the soldier's mind, because they are performing maintenance deeper into the system architecture than BIT/BITE is supposed to go.

The result of this scenario is a complex interweaving of BIT/BITE with contractor proprietary test equipment, board-swapping as a diagnostic tool, and the use of IDS/IGS manuals on-equipment by a Unit/IDS maintenance "team", making the specific performance of BIT/BITE difficult to define.

The most notable impact of these design-for-supportability shortfalls is that they strengthen the role of the contractor in the maintenance function. The BIT/BITE and TMDE deficiencies increase the role the contractor plays in both finding workarounds and in providing proprietary TMDE. Either way the within-the-battalion contractor presence continues to grow, catalyzed by BIT/BITE workarounds, inadequate MOS training for IDS, and tech manual deficiencies.

C.3 TMDE

TMDE problems seem to coalesce at the IGS level, and are generally traceable to deficient fielding. For some systems (*e.g.*, MLQ-34), IGS maintenance was planned as an interim contractor task: currently, TPS development is still incomplete for the MSM-105, the contractor has a proprietary lock on IGS TMDE, and the system's go-to-war capability is suspect. For others (*e.g.*, TACSAT), organic IGS maintenance is authorized but some IGS units were not equipped with all the necessary TMDE: this problem combines with the wide variety of IGS organizational approaches (green-suit COSCOM *vs.* civilian DOL; Battalion-organic *vs.* external AMSF) to further confound the situation.

It appears that the further away from the battalion level the TMDE is authorized, the less complete was its fielding. For example, AVIM units supporting the ASN-86 report that the authorized special test sets (ASM-385 and -386) do not adequately support the repair requirement; instead, those units rely on a "hot mock-up" test bed which is itself incomplete. A similar situation exists wi test equipment for the ground-based portion of IGR-V: special test equipment exists for the IPF subsystem, but units report having to pull a mux box out of the AGE van, or use the IPF spare mux, to complete testing.

Finally, some TMDE shortages are reported at the Unit and IDS levels, as noted in *Chapter III*. For example, GSC-52 satellite stations collocated with other terminal systems have expressed a need for their own sets of common TMDE, rather than being forced to share with facilities remote from their shelters; and some TACSAT units have voiced a need for better TMDE coverage of their real-world deployments.

C.4 DOCUMENTATION

There are two aspects of the documentation factor that merit comment:

- Maintenance concepts, and
- Technical manuals.

They are treated in turn in the next two paragraphs.

C.4(a) Maintenance Concepts

As a general observation for the systems reviewed, there is a poor correlation between each system's maintenance concept, the application of its MAC guidance, and the system's O&O concept. The result of this situation is to call into question the go-to-war capability of the tactical systems studied. This is not viewed to be an issue with the fixed station GSC-52 terminal, but these comments are pertinent relative to the other sample systems.

The following conditions were found:

- Maintenance concepts that are incompatible with system O&O concepts, exacerbated in cases where a single system has multiple O&O concepts;
- Disregard for MAC guidance to the degree that the maintenance concept is not fully tested or practiced; and
- Inconsistent procedures for providing IGS maintenance support for a single system.

High correlation between system organizational and operational concepts and system maintenance concepts is an essential ingredient in effective ILS. If resources for ILS are acquired against a maintenance concept that is incompatible with intended employment, combat sustainability will suffer.

The TACSAT situation illustrates this concern. On the one hand, the TACSAT maintenance concept specifies

- That each TSC-93 gets a PLL, but most of the TSC-85s do not;
- That the EMS for TACSATs organic to the Signal Battalion will be deployed with the TSC-85 terminals; and
- That redundancy in the TSC-85 eliminates the need for a PLL.

On the other hand, employment concepts vary from one battalion to another:

- In one situation, the TSC-85 terminals are deployed in one battalion and the TSC-93s in another, negating EMS support to the full system;
- TSC-85 terminals in another Signal Battalion are deployed at opposite boundaries of Western Europe, voiding totally the maintenance concept and its assumptions.

It is clear in the case of TACSAT that there is little or no correlation between the two key concepts. Planning and doctrine, to be effective, must be internally consistent and must be enforced. Here is a scenario in which the baseline does not exist. Whether directly the result thereof or not, it is noted that TACSAT has yet to be incorporated into the USAREUR GDP because of uncertainties about sustained system availability.

Army maintenance policy (*AR 750-1*) decrees that the MAC is the primary tool for assigning tasks to maintenance levels. The MAC represents the implementation of the system maintenance concept, which in turn guides the acquisition of maintenance resources -- training, provisioning, TMDE, technical manuals, and so forth. With the systems studied, significant elements of the MAC are disregarded:

- Operator-repair personnel on the TRITAC switches are performing some IGS maintenance on-site;
- The AVUM-AVIM demarcation for ASN-86 is very indistinct and varies from one battalion to another; and
- IGR-V provides a tailored on-site combination of all maintenance levels from unit through depot.

Study of these systems indicates that the internal consistency and logic of ILS planning is compromised, and the audit trail from planning to application is being broken by independent interpretations of doctrine and guidance. If nothing else, the logic of consistent ILS planning and execution should yield an optimum return on the ILS investment. Under present conditions, the return is at risk.

Variations on the theme of IGS maintenance have resulted in a potpourri of support capabilities for the sample systems. For a given system, IGS maintenance can be provided by Installation, COSCOM, or Battalion organic resources. Of these, an IGS maintenance base residing in an installation DOL typically suffers from incomplete TMDE and spares fielding, and leaves the low density system void of proven IGS capability if deployed.

This inventory of IGS sources is not transparent to the users, and leads them to question the completeness and responsiveness of IGS, in turn catalyzing organic workarounds and further eroding regard for the MAC.

An inherent characteristic of IGS maintenance capabilities for the sample systems seems to be that conscious decisions were made during acquisition to shortcut the provision of this resource, introducing CLS as the alternative of choice. This course of action has resulted in an incomplete IGS capability where Installations are involved, and an on-site contractor capability for some systems that has blurred the Unit-IDS-IGS MAC distinction and has, in application, appeared to compromise Army policy on Interim Contractor Support.

Synthesizing all of these findings into a single observation, ILS planning has been compromised in the interest of short-cutting ILS investment, and has resulted in very uncertain go-to-war capabilities for the sample systems.

C.4(b) Technical Manuals

The principal concern expressed about tech manuals for the sample systems is that they are either incomplete or too cumbersome to use for troubleshooting. In the case of the GSC-52, the deficiency in two critical areas -- the theory of operation and the troubleshooting procedures -- is well recognized and corrective action is underway. This is the only one of the sample systems for which TM improvement plans were reported by those interviewed.

In some cases the number of tech manuals is daunting: for example, the TRITAC switch set covers nearly 100 volumes; the GSC-52 covers 34 volumes; and the IGR-V tech manual set comprises over 200 volumes covering all of the on-site maintenance authorization; . It is not surprising that maintenance personnel often find NET handouts to be more concise and usable in troubleshooting than the formal TMs.

The case of TACJAM (MLQ-34) is notable. The principal troubleshooting and on-equipment repair procedures are contained in the -24 manuals, which are used by the contact-team IDS repairman. They are not stored in the equipment, but are brought along on the contact team visit. The troubleshooting diagrams are hundreds of pages long, and fault messages/conditions are of marginal use without them.

C.5 IMPACT OF SUPPLY ON MAINTENANCE

In *Section IV.B.7* we discussed the impact of maintenance problems on supply for the sample systems. We now turn to consideration of the opposite direction, and note two impacts of supply on maintenance:

- The effect of inadequate LRU supplies on the maintenance process, and
- The effect of the Automatic Return Item program on IGS-level repair.

Neither is a low density problem *per se*, but both may reflect a combination of factors discussed in *Chapter II* as the low density syndrome.

C.5(a) LRU Supply Shortages

The first effect appears visibly with the ASN-86, MLQ-34, and IGR-V. Chronic shortages of LRUs force the field to repair unserviceable LRUs more rapidly than otherwise, in order to keep mission-critical end items in a ready state. When unserviceable LRUs cannot be repaired quickly enough, and serviceable spare LRUs are not available, the units rely on a variety of workarounds:

- Pulling LRUs from an unserviceable end item;
- Pulling LRUs from a redundant higher-level assembly; or
- Pulling LRUs from a serviceable end item, rendering it unserviceable.

The lower the density of the end item, the greater will be the impact on readiness of the last workaround listed; whether the converse is true -- that low density systems tend to have leaner LRU sparing -- is not known. Note also that putting an LRU on the AIMI list, or otherwise restricting authorization for its stockage, can have the same effect on maintenance workarounds as a supply shortage, as troops find other means of making replacements available.

C.5(b) ARI and the IGS Workload

There are indications of a conflict between (a) CECOM's intention to repair selected components at the intermediate echelon and (b) its identification of those components as critical shortage items requiring automatic return to the depot. The result is an almost total lack of IGS-level workload for such items, despite the development and distribution of test program sets (TPS) for automatic test and repair.

The reason for this situation bears examination, for at least two reasons:

- If IGS-level repairs are not being accomplished in accordance with the provisioning plan, then spares pipelines need to be increased to cover the longer retrograde/repair turnaround time for depot repair; and
- If IGS-level repairs are not being accomplished in accordance with the maintenance concept, then the value of TPS development and fielding to the retail level is called into question.

The basis of this finding is associated with the TRITAC switches, as follows.

Of all the end items included in the low density sample, only the TTC/TYC-39 family of TRITAC switches has fielded TPS for MSM-105 repair at the IGS level. For example, GSCP (Pirmasens) identified TPS on hand for repair of eleven components of the switches, along with another seven components common to the TSQ-73 and/or TACFIRE systems; similarly, both the 58th LEM at Fort Bragg and the 6th Support Center (Camp Carroll, Korea) have MSM-105s and TPS for TRITAC switch circuit card repair.

However, site visits consistently revealed little or no IGS workload for the MSM-105 for the switches at these sites in practice:

- At Fort Bragg, the IGS reports that it has never repaired a TRITAC switch circuit card, although at least once it was asked to test (go/nogo) a set of cards out of the 50th Signal Bn's PLL;
- At Camp Carroll, the IGS reports that none of the boards is ever job-ordered into the shop; and

- At GSCP (USAREUR) the IGS workload appears to be limited to common low price boards and to unique TRITAC power supplies, as detailed below.

At GSCP (USAREUR) the dominant repair workload for switch components consists of (a) low price stock-fund circuit cards common to TSQ-73 and TACFIRE using the MSM-105, and (b) higher-price secondary-funded power supplies unique to TRITAC and not using the MSM-105. *Table IV-1* shows the thirty-three TRITAC switch components on the USAREUR DX-CEM (Direct Exchange Communication-Electronics Missile) list, along with relevant current AMDF parameters, their TPS status at Pirmasens, and the total repairs completed by GSCP during the past twelve months (*Table IV-2* shows the source and meaning of the data):

- The dominant repair workload appears in the top four lines, accounting for 285 out the total 320 repairs during the past year. These are low cost stock-funded items ("MAT CAT" is "2" in the second position) that are common to the TSQ-73 and TACFIRE systems. None of them is ARI coded on the AMDF.
- The remainder of the repairs appear in five NSNs, all but one of which is a power supply, and none of which is covered by TPS ("N" appears in the "TPS" column). These are free-issue secondary items ("MAT CAT" is "X" in the second position) unique to the TRITAC switches. All of them are ARI coded "C" for high-priority automatic return of unserviceables to the wholesale level.

It thus appears as if none of the TRITAC-unique TPSs is being used at GSCP, a finding which is consistent with the other MSM-105 facilities. Moreover, the only TRITAC-unique repairs which are being accomplished at GSCP appear to be the free-issue depot-recoverable secondary items that are reportedly in worldwide short supply.

One possible source of the current situation is the conflict between the ARI code and the MSM-105 repair capability at the intermediate echelon.

- On the one hand, the worldwide AMDF ARI code directs automatic return of an unserviceable item, without waiting for disposition instructions, using priority ranging from 03 (ARI "N") to 13 (ARI "U");
- On the other hand, local SAILS computer codes indicate repair capability at the IGS level.

It is our understanding, based upon review of SAILS documentation and discussion with personnel at USALOGC, that SAILS automatically identifies an item as ARI (based on quarterly AMDF update) as soon as it is picked up on the asset balance file in unserviceable condition, and automatically produces the turn-in notification and materiel release documents to ship the item back to the appropriate CONUS depot, without checking any of the local reparability codes. While the local Item Manager is informed of this action, his confirmation is not required or expected, and only manual intervention can prevent shipment back to the depot. Since SAILS processing appears to be required for all stock-funded items (in order to ensure proper credit for turn-in from lower echelons), this situation would guarantee that there is no MSM-105 workload for stock-funded ARI components; it would probably also make below-depot repair of secondary-funded items more difficult by requiring exception management to capture the turn-in and keep it from being automatically returned to the depot.

<u>Processing of turn-ins by SAILS (and, in future, by SARSS) should be reviewed in the light of this finding</u>. If the above condition indeed applies, it should be corrected by having SAILS/SARSS logic check not only the ARI code but the local reparability codes (for example, Item Control Code) as well. In this way, those intermediate-level sites without MSM-105 repair capability for a particular NSN would automatically return unserviceables to the depot, while those with the repair capability would call out the unserviceable asset balance to the Item Manager for expedited local repair consonant with the critical-shortage status of the item.

Table IV-1. USAREUR "DX-CEM" List for TRITAC Switches

Stock Number	ARI	Recover Code	MAT CAT	Unit Price	Item Name	TRITAC TPS Status	12-month Repairs
5895-00-349-5941	-	H	G21RJ	$136.00	CIRCUIT CARD ASSEMB	Y (& TSQ-73 & TACFIRE)	46
5895-00-349-5969	-	H	G21RJ	$351.00	CIRCUIT CARD ASSEMB	Y (& TSQ-73 & TACFIRE)	141
5895-00-349-5970	-	H	G21RJ	$126.00	CIRCUIT CARD ASSEMB	Y (& TSQ-73 & TACFIRE)	45
5895-00-349-5974	-	H	G21RJ	$142.00	CIRCUIT CARD ASSEMB	Y (& TSQ-73 & TACFIRE)	53
5895-00-349-5993	-	H	G21RJ	$146.00	CIRCUIT CARD ASSEMB	Y (& TSQ-73 & TACFIRE)	
5999-01-010-5103	-	H	GX1RJ	$96.33	CIRCUIT CARD ASSEMB	Y (& TSQ-73 & TACFIRE)	
5895-01-076-2800	C	D	GX1RJ	$926.00	POWER AMPLIFIER	Y (& TACFIRE)	
5805-01-078-5953	-	L	G21RQ	$543.00	CIRCUIT CARD ASSEMB	Y	
6130-01-092-7778	C	L	G24RH	$2,042.00	LVPS ASSEMBLY	Y	
7050-01-109-2109	C	L	G21SK	$1,872.00	DECODER	N	
5999-01-110-6958	C	D	GX1RJ	$1,344.00	CIRCUIT CARD ASSEMB	N	9
5805-01-120-2929	C	D	GX1RQ	$3,417.00	POWER PROCESSOR	N	
6130-01-120-2969	C	D	GX1RQ	$3,409.00	CHARGER,BATTERY	N	
5805-01-120-2971	U	D	GX1RQ	$4,645.00	POWER SUPPLY ASSEMB	N	
5805-01-120-2972	C	D	GX1RQ	$6,096.00	POWER SUPPLY ASSEMB	N	2
5805-01-120-2973	U	D	GX1RQ	$4,466.00	POWER SUPPLY	N	
5805-01-120-2976	C	D	GX1RQ	$13,841.00	POWER SUPPLY	N	
5805-01-120-2977	C	D	GX1RQ	$7,010.00	POWER SUPPLY	N	6
5805-01-120-2982	C	D	GX1RQ	$4,263.00	POWER SUPPLY	N	
5805-01-120-2983	C	D	GX1RQ	$2,525.00	POWER SUPPLY	N	
5805-01-120-3069	C	L	G21RQ	$2,021.00	CIRCUIT CARD ASSEMB	Y	
5805-01-120-3088	U	L	G21RQ	$362.00	CIRCUIT CARD ASSEMB	Y	
5805-01-120-3139	C	L	G21RQ	$649.00	CIRCUIT CARD ASSEMB	Y	
5805-01-120-3173	C	L	G21RQ	$583.00	CIRCUIT CARD ASSEMB	Y	
5805-01-120-3174	C	L	G21RQ	$975.00	CIRCUIT CARD ASSEMB	Y	
5805-01-120-3246	C	L	G21RQ	$598.00	CIRCUIT CARD ASSEMB	Y	
5805-01-120-3252	U	L	G21RQ	$277.00	CIRCUIT CARD ASSEMB	Y	
5805-01-120-3269	C	L	G21RQ	$239.00	CIRCUIT CARD ASSEMB	Y	
5805-01-121-6545	C	D	GX1RQ	$4,800.00	POWER SUPPLY	N	
5805-01-121-6546	C	D	GX1RQ	$4,432.00	POWER SUPPLY	N	
5805-01-126-9261	C	D	GX1RQ	$7,850.00	POWER SUPPLY	N	11
5805-01-127-0725	C	D	GX1RQ	$3,734.00	POWER SUPPLY	N	7
5999-01-204-0383	C	L	G21RQ	$673.00	CIRCUIT CARD ASSEMB	Y	

Table IV-2. Data Sources for Table IV-1

The thirty-three NSNs appearing on the previous page include two groups:

- 26 NSNs appearing on the USAREUR "DX-CEM List" (30 OCT 87) with the End Item indication either "TTC-39" or "TYC-39"; and
- 7 NSNs appearing on the same list with either "TSQ-73" or "TACFIRE" as the end item, but which also appear in GSCP's TPS listing (15 AUG 86) as "TTC,TYC-39" -- these are mostly cards in the Litton processor.

Data on the table was taken from both these listings, along with two others:

- AMDF data extracted on 21 May 1988, and
- Printout of 12-month repair summary data provided by GSCP (8 MAR 88).

Data and sources are as follows.

Data Item	Meaning and Source
Stock Number	NSN, from either "DX-CEM List" or "TPS List".
ARI	Automatic Return Item code, retrieved from the AMDF. "C" requires automatic return by priority 06, and "U" by priority 13.
Recover Code	Recoverability Code, retrieved from the AMDF; it indicates the lowest echelon authorized to dispose of the item. "H" is IGS level, "D" is depot level, and "L" is a Special Repair Activity (SRA).
Unit Price	Unit of Issue Price, retrieved from the AMDF.
Item Name	Nomenclature, in the AMDF.
TPS Status	"Y" indicates that a TPS is on-hand at GSCP to perform the repair; additional end items indicated as using that same TPS appear in parentheses after "Y". Source is the GSCP "TPS Listing".
12-Month Repairs	Total repairs appearing on the GSCP Summary Repair Listing.

D. READINESS

In the previous chapter, *Section III.D*, we noted that readiness reporting for the sample low density systems is either nonexistent or highly subjective. As discussed, there may be three serious effects:

- The absence of formal readiness reporting removes the high-level Army-wide visibility which may be needed to correct both acute and chronic support problems;
- The credibility of what reporting exists may be undermined by its subjective basis; and
- Redundancy in some systems contributes substantially towards achievement of target readiness rates, by reducing dependence on rapid supply and maintenance turnaround, but at the same time may increase ambiguity in readiness reporting and overstatement of capability.

Readiness measurement in systems with extensive redundancy is not always straightforward; for example, in the case of the TRITAC switches, various elements of a switch may be redundant in some applications and for some subscriber populations but nonredundant in others. In such cases, however, the fact that some readiness elements are subjective is no reason to leave all elements to judgment.

Another compounding element is presented by BIT/BITE. If a system does not continuously monitor and report total system status, it is possible that the operator does not know at certain times what the status of the system's readiness is. There are also cases in which the system cannot address all of its elements through BIT/BITE, and certain faults may go undetected until the system requires one of those elements. Both situations are found in the TTC/TYC-39 switches; as a result, for example, certain line terminations may not be known to be unserviceable until a subscriber attempts to access them. The point here is not just that there are cases in which BIT/BITE does not adequately support completely objective readiness reporting; more important is that such BIT/BITE lapses provide unwarranted confidence in the availability of an end item to meet the mission.

Lapses in BIT/BITE may understate readiness as well. In one unit's MLQ-34, for example, we saw a fault indicator light that was lit, but the operators were certain that the system element really worked; they believed that the fault indication would clear if the system were shut down and restarted. This is a case where BIT/BITE may understate readiness. A similar conclusion comes from one GSC-52 site, where operators estimate that only about 20 percent of fault indications are "real".

So far we have discussed only the technical side of readiness -- whether the end item is "up" or "down" -- and the manner in which it is reported. There is an equally important side which was addressed in *Section IV.C.4*: the "go-to-war" capability. There are several issues associated with this aspect of readiness, and they fall into two areas:

- The availability of personnel, materiel, and other critical logistic elements in quantities adequate to handle wartime requirements;
- The extent to which maintenance and supply depend upon facilities or logistic elements which are unavailable organizationally or geographically in wartime.

The first is just the "numbers" factor: examples include the personnel and materiel pool, the Army's ability to replenish them at combat rates, and transport capacities. The second is a "positional" factor, and is concerned with whether the "numbers" are in the right place at the right time.
An example of a problem in the "numbers" area is found with IGR-V: even though it is currently handling up to 50 percent of its TOE combat capability, its users concede that it can barely support the current mission and could not handle a combat surge. Examples of "positional" concerns include all of those systems which depend on contractor maintenance in the field.

In summary, the following points are noted in assessment of readiness:

- Readiness of the several low density systems sampled is subjectively defined, loosely applied, and unreported;
- Redundancy as a design factor in some systems offers significant relief from shortfalls in maintenance and supply resources, thus contributing to readiness, but also may lead to ambiguity in readiness reporting;
- BIT/BITE of most systems sampled offers only partial identification of system status, and may not always be credible; and
- Go-to-war capability may be seriously compromised by dependence on a peacetime approach to logistic support and readiness measurement.

V. CONCLUSIONS AND RECOMMENDATIONS

V. CONCLUSIONS AND RECOMMENDATIONS

The preceding two chapters presented the study team's assessment and findings, first built up from the various weapon system perspectives (*Chapter III*), then consolidated across the entire low density sample population (*Chapter IV*). A number of issues were identified in those chapters, some of which were related to the "low density syndrome" (*Chapter II*) and others of which were not.

In this chapter we summarize the principal conclusions drawn in those chapters and present our recommendations to improve the support of CECOM's low density systems. Since many of the problems identified are systemic in nature and common to all the sample systems, this chapter begins with ***General Conclusions and Recommendations***. The second section then addresses ***System-Specific Conclusions and Recommendations*** with a focus on those problems which are limited to particular systems in the sample.

A. GENERAL CONCLUSIONS AND RECOMMENDATIONS

1. **Wholesale supply is intensively managed, with Item Managers taking many manual intervention and override actions. Nonetheless, supply delays and spares shortages are still the most commonly expressed concerns of the C/E Community and users of the sample low density systems.**

   Wholesale supply requirements for the low density system sample are mostly nondemand-supported, a situation requiring human intervention to set and maintain stockage objective levels and to prevent migration to nonstocked status. Detection of requirements for uncataloged items, and demand forecasting in general, are complicated by the large number of spares with low individual usage rates. Requisition fill is further delayed by procedures which attempt to enforce turn-in of unserviceables by requisitioners.

   Spares provisioning was a process of manual selection based on engineering judgment, focused on a narrow range of items procured in limited quantities. Sustainment of replenishment supply receives intensive human attention at wholesale and retail levels to manage the resulting shortages in range and depth. Low density systems may also be more vulnerable to the impacts of obsolescence and dwindling supply sources. Wholesale Requirements Objectives are either established automatically (CCSS) on the basis of percent requisition fill, or manually (Item Manager) by rule of thumb: weapon system readiness requirements are not explicitly factored into either CCSS or SESAME at the wholesale level.

   <u>Recommendation</u>

   The following C/E Community initiatives should be taken by CECOM to obtain lasting improvement in wholesale spares supply support for low density systems:

   - **Reduce the need for intensive wholesale item management of low-demand items by reducing the amount of automatic migration between stocked and nonstocked status, reducing error in demand forecasting, and improving procedures for setting and maintaining asset level objectives. More responsive wholesale supply will lessen the need for intensive supply management at the retail level as well.**

1. Wholesale Supply (continued)

- Streamline requisition processing to ensure high priority requisitions are filled/resolved within time standards, part-number requisitions are properly treated and used as the basis for followup provisioning action, and accurate followup status is provided to requisitioners.
- Review policy, procedures, and formulas for life-of-type buys to ensure that mechanisms are in place to detect impending obsolescence, compute remaining-life requirements, and initiate timely procurement action.
- Review provisioning and post-provisioning processes to ensure that criteria for initial item selection and cataloging are appropriate for low density systems, that PM Office spares plans/actions are fully integrated into the CECOM budgeting and execution processes, and that CCSS factors and wholesale stockage levels are updated in uniform and timely fashion as requirements change.
- Extend sparing-to-availability concepts to the wholesale level, to set and track Requirements Objectives on the basis of requisition fill response time targets and not just on percent fill.

Implementation of most of these recommendations requires attention at both top management and detailed action levels within the C/E Community. *Section IV.B* provides detailed amplification of these points.

2. **Retail supply is intensively managed as well, predominantly through normal Army channels. Nonetheless, persistent shortage of initial and replenishment spares is still the most commonly expressed field concern for the sample low density systems.**

Retail supply requirements for the low density system sample are almost entirely nondemand-supported, a situation requiring human attention to set and maintain stockage authorization levels, and to prevent automatic turn-in of serviceable assets after the initial demand development period.

Field stockage is almost entirely limited to organic PLL and has changed little from initial provisioning levels. Each of the sample systems had its initial issue PLL based on engineering judgment, rather than on formal application of the SESAME model. None of the systems was fielded with ERPSL authority and none appears on any MPL, yet none of the PLLs seems to be challenged officially under the rules of AR 710-2. Discipline needs to be introduced into this process to align it with Army standards and reduce uncertainty and confusion in the field.

In some cases, low density systems have not yet been formally released to "unofficial" users, who appear to have low priority on requisition fill in consequence. In other cases, initial issue shortages remain backordered to the unit more than a year after fielding.

The limited supply of some spares has placed increased reliance on rapid field turnaround of repairs. This has further cemented dependence on contractor support in cases where the contractor is the only one capable of doing such repairs. In addition, conflicts between catalog data (AR[illegible]) and field repair capabilities may result in field-reparable components being automatically returned to the depot rather than being repaired in the field, with negative impacts on maintenance, supply, and budget.

2. Retail Supply (continued)

Recommendation

A number of additional initiatives should be taken by CECOM to obtain lasting improvement of retail spares supply support for low density systems:

- Review provisioning and post-provisioning processes to ensure that ASL/PLL preparation is coordinated between CECOM and PM Offices and fully integrated into the CECOM budgeting and execution processes, and that retail stockage levels are updated in uniform and timely fashion as requirements change.
- Review policy and procedures with regard to initial spares shortages and materiel release, to reduce the number of "unofficial" unsupported users of critical low density systems.
- Bring the sparing-to-availability process under control by
  - -- Dedicating the necessary manpower and mix of disciplines to SESAME and MPL processes, in recognition of the fact that neither SESAME nor MPL will "automatically" produce the right numbers by itself;
  - -- Improving local standards and model documentation for CECOM systems, to minimize error and deviation from support doctrine;
  - -- Providing training and certification in math model operation within the CECOM and PM community, to raise skill levels among the users;
  - -- Participating more actively in budgeting and sparing processes, to ensure thorough integration into the provisioning mainstream; and
  - -- Institutionalizing a permanent audit trail of formal spares planning data and documentation for each weapon system, to provide baselines for lessons learned, ERPSL/MPL broadcast to the field, and post-provisioning review.
- Review CECOM standards and procedures for assigning Automatic Return (ARI) codes to field reparable assemblies, so that IGS units do not automatically return items which they are capable of repairing, particularly in cases where the Army has invested in TPS development for IGS repair. At the same time, ensure that CECOM standards and procedures on fund (FIA) coding are consistent with actual TPS capabilities in cases where TPS development is delayed. Review SAILS and SARSS logic with respect to ARI processing of IGS-reparable items, and initiate action to correct any conflicts with IGS-level repair objectives.

Most of these recommendations require action at both top management and detailed action levels to implement. *Section IV.B* provides detailed amplification of these points.

3. **Maintenance is being performed successfully. However, this achievement is built on a foundation of heavy contractor involvement, reliance on unorthodox maintenance procedures, and disregard for the formalities of Army maintenance levels and weapon system MAC authorizations.**

Gaps in ILS capabilities for the sample systems have resulted in a mixture of nonstandard maintenance procedures adopted in order to maintain system

readiness. Contractors are involved down to unit level maintenance because of personnel quantity/quality shortages; troubleshooting practice includes fault isolation by component swapping because of shortfalls in BIT/BITE capabilities and Tech Manual procedures; contractors bring proprietary TMDE to the situation because of qualitative or quantitative TMDE deficiencies; and individuals often perform maintenance tasks not authorized at their echelons due to unavailability of higher-echelon manpower or shortages of spares. The result is a large-scale blurring of maintenance doctrine and allocation, and institutionalization of workarounds.

Recommendation

Determine maintenance doctrine appropriate for each weapon system, recognizing that standard Army doctrine may not be appropriate and may require exceptions. Review current MAC against the determined doctrine for the system and analyze ongoing workarounds of tasks. Revise the MAC to incorporate both appropriate doctrine and task allocation which best implements doctrine and supports system maintenance. Revise contractor's SOW to establish his role in maintenance as a trainer and quality controller to enhance the Army's capability, and strengthen the maintenance structure.

4. **The fundamental support problems seen in the sample weapon systems stem from a failure to acquire complete ILS capability, made more visible by the low density of the systems.**

There is a characteristic pattern of ILS shortfalls in the sample systems:

- *Shortages in maintenance personnel strengths against authorization;*
- *Extensive OJT requirements to progress AIT maintenance graduates up to a journeyman skill level;*
- *Shortfalls in the range and depth of provisioning spares;*
- *Shortages in requisite TMDE and in the effectiveness of BIT/BITE; and*
- *Poor correlation between system O&O concepts and support concepts.*

These and other observed ILS deficiencies in the sample systems are indicative of a failure to invest in the requisite ILS planning or of a failure to pursue a disciplined approach to ILS.

For systems with low deployment density the effects of such deficiencies are visibly amplified, whether or not the absolute shortfalls are any different from more populous systems. The case of Improved Guardrail makes the point: each time a single IGR-V system stays down for want of any ILS element, one-half of the total Army capability is lost. Just as there is strength in numbers, there is an increased vulnerability to ILS gaps at low density.

Recommendation

Discipline the ILS-System Engineering process to ensure that the products of its execution are compatible and fully supportive of the systems. Many of the details of recommendations herein are predicated upon this one and, to be effective, must be enforced in detail.

5. **Interim Contractor Support has successfully permitted early fielding of some critical low density systems. However, at the same time, it has also resulted in incompatibility between system O&O and support concepts, masked severe personnel shortages and training deficiencies, and allowed the Army to postpone long-term resolution of logistic problems.**

The sample systems are representative of the thrust in Army modernization efforts in C³I aimed at multiplying the battlefield effectiveness of available forces. In some cases, the need to get a capability into the field has driven system fielding to proceed in spite of known ILS deficiencies, including a severe shortage of trained military repairmen.

Contractor logistic support has been successful, as evidenced by the fact that all units but one visited in the sample survey were reporting as operationally ready. This success has allowed the Army to postpone corrective action on ILS shortfalls, and this delay serves to entrench the on-site contractor presence for some of the sample systems. CLS may indeed be the most cost-effective course of action to follow for some systems, but it appears to have been chosen by default rather than by design: objective assessment of both cost and combat operational effectiveness seems to have been avoided.

The more deeply the contractor is involved in on-site on-equipment maintenance, the more uncertain is any assessment of system go-to-war capability. For most of the sample systems, a very confusing intermixing of support concepts has been found: at one extreme, IGR-V is supported by providing on-site maintenance from organizational through depot levels, using military, contractor, and Army civilian personnel. In the case of TACJAM, little capability for fix-forward system maintenance is provided at the Unit level; instead, there is an almost total reliance on specialized GI contact-team maintainers at the IDS level to perform on-equipment maintenance, and on civilian contractors to conduct off-equipment repair at the IGS level. Coupled with fielding shortfalls in supply, the ILS overview for the sample systems suggests a requirement to review closely the compatibility of O&O and support concepts.

Recommendation

The C/E Community should perform Cost and Operational Effectiveness Analysis (COEA) on each system with CLS/ILS: AR 750-1 has specific guidance on the use of contractor support and the regulation must be enforced. An assessment should be made of the employment and support concepts of each system, and changed where necessary to ensure correlation, consistency, and readiness.

6. **Interim Contractor Support seems to be implicitly accepted by CECOM as the solution to ILS problems, without objective challenge to the economics of each case. In some cases "interim" becomes "life-cycle" by default.**

The sample weapon systems display a wide range of contractor involvement in logistic support. At the depot level nearly all the sample systems rely on production contractors to repair modules at the direction of CECOM and under the supervision of an Army depot. At the IGS level several of the systems rely on production and independent contractors to repair modules for rapid turnaround to using units, partly as a result of spares shortages. At the IDS and Unit levels some of the systems rely on on-site

6. *Interim Contractor Support (Continued)*

contractor assistance for a variety of tasks, ranging from on-call emergency service, through assistance in GI training, to intensive hands-on conduct of routine maintenance.

No general patterns were found with regard to factors shaping the degree of contractor involvement. However, in no case did there appear to be any objective assessment of the requirement for contractors, or consideration of the economics and operational effectiveness of alternative approaches to support. In at least one case, an explicit early-on commitment to perform such an assessment and optimization of resources appears to have been abandoned somewhere along the way to fielding, and intense reliance on contractor support is the result.

Instead of objective evaluation and trade-off of alternative support concepts, we find an apparently automatic turning to contractors by default as the only way to meet fielding schedules with incomplete organic ILS. What begins as "interim" contractor support too easily becomes life-cycle CLS, in the absence of the objective analysis and planning that are required to schedule, budget, and manage transition to organic support.

The role of contract support demands objective challenge system by system in order to determine whether it is appropriate in each case, and to what degree, and at what cost in resources and war-fighting capability.

Recommendation

This implicit CECOM policy must be challenged objectively, and an explicit policy must be established that coincides with Army policy (AR 750-1 and AR 700-127), or else action should be taken to change Army ICS/CLS policy.

7. **Army personnel and training systems are not consistent with the needs of low density system managers. The number of soldiers furnished is far below requirements and they are inadequately or improperly trained.**

Operators and maintainers of low density systems are difficult to recruit, require long school periods and formidable OJT to become competent in their MOS, and are difficult to retain in the active forces.

The personnel situation for low density systems is particularly distressing. These are fine and intelligent soldiers who in many cases have been trained for GS repair but sent to a DS unit. Unfamiliar with the end item their immediate utility is sub-par. At IDS they are limited to exchange of LRUs and as a result lose motivation quickly. Except at Fort Bragg and Korea, most units have personnel on hand far below TO&E authorizations.

The Training Base is not responding to the needs of the field. The 36L (TRITAC switch repairmen) felt the Signal School was inadequate in their POI, the instructors, and the system specific training they did not get. The Intelligence School trains a 33T for GS repair of CEWI systems, but he doesn't get to use the skill he has developed.

Recommendation

The entire issue of personnel and training for low density systems should be the subject of a separate study by CECOM and the appropriate school.

8. **The CECOM maintenance LAR is becoming less capable of responding to the user's maintenance problems.**

Based on the language of AR 700-4, the CECOM maintenance LARs believe they are prohibited from performing any hands-on maintenance for their systems except for instructional purposes. In addition, the presence of an ICS or CLS contractor negates the value and erodes the skills of the LAR. He is becoming an expediter of parts and requisitions, and gradually losing his technical competence.

Recommendation

As a minimum, CECOM should insure their maintenance LAR is trained and updated periodically by the prime contractor and furnished with the latest available manuals and TMDE. A change in the regulation should be proposed that will restore the LAR's technical responsibilities and skills.

9. **Army readiness reporting is not equally effective for the sample systems, resulting in unbalanced reporting procedures, locally determined readiness criteria, and unknown readiness status.**

Only three of the six sample system families are subject to full and regular readiness reporting, but even these three have the value of such reports undermined by subjective determination of status, local variation in reporting criteria, and loose implementation of standards.

As a result, it is virtually impossible to detect systemic readiness problems, identify and correct the maintenance and supply problems at fault, or measure the impact of improvement in support on system performance.

Recommendation

CECOM should review readiness criteria for low density systems and tighten those which are ambiguous or overly subjective. Initiatives are needed to capture status of critical nonreportable systems regularly at CECOM, particularly in those cases where prime mission equipment currently receives only secondary attention.

10. **BIT/BITE shortfalls are common to the systems studied. Where compounded by inadequate TMs and training, the result is a variety of workarounds and an increased dependence on Contractor Logistic Support.**

Good BIT/BITE is particularly important to systems which are complex and whose failure patterns are irregular and/or infrequent, both of which are characteristic of the low density sample systems. Even the best of the sample systems self-diagnoses only about 75 percent of failures to a single LRU, leaving the balance to be resolved by trained maintenance personnel relying on tech manuals and TMDE for troubleshooting. Because of shortfalls in training and tech manual presentation, maintainers are often not able to accomplish the mission in timely fashion; as a result, maintainers resort to such workarounds as LRU-swapping and cannibalization to restore failed systems and components. In addition, such gaps in the total BIT-TM-TMDE-Training capability are readily filled by contractors, increasing their role at all echelons of the support system.

10. BIT/BITE (Continued)

Recommendation

CECOM should initiate a review of the troubleshooting procedures in the sample systems to bring about, in conjunction with TRADOC schools, those changes that will yield improved maintenance capability: BIT/BITE product improvement where feasible, improved TMDE where proprietary or other capabilities exist, changes to tech manual troubleshooting procedures as required, changes in TRADOC POIs to increase system-specific and IDS levels of training, and changes in PLL where appropriate.

B. SYSTEM-SPECIFIC CONCLUSIONS AND RECOMMENDATIONS

B.1 GSC-52

Conclusions

Support for the GSC-52 is not perfect, but it is the most successful of all the sampled systems. However, planning and execution of fielding are perceived by the users to be less than satisfactory.

- TMs are generally acknowledged to be cumbersome, difficult to use, and lacking in troubleshooting continuity: they are being rewritten.
- TMDE authorizations are insufficient. Users are being asked to share TMDE and personnel at collocated sites. In Korea it is proposed to share TMDE with a site 20 kilometers from the GSC-52 location.
- In Korea, as elsewhere, fielding involves component shipment and on-site assembly by a USAISC team. Component arrival is out of synch with projected activation date. The C.O. projects a personnel shortage during transition and would like ICS.
- There is no formalized guidance or planning for spares requisitioning. NSNs are missing and there is confusion on the project code. Typed listings and provisioning parts are being developed without benefit of SESAME or other formalized procedures. Spares fill is generally deficient, with 90 percent fill reported in two sites visited.
- It appears that spares acquired for provisioning initial fill for sixteen as-yet-unfielded systems are being used up in satisfying replenishment requisitions to support the ten currently fielded systems.

Recommendations

- Follow up on in-process TM revision to ensure timely delivery of completed products that will satisfy the need.
- Review TMDE and personnel authorizations. Ensure adequate people and equipment authorized at sites.
- Review fielding plans to optimize arrival, assembly, and activation of new sites.
- PM SATCOMA to use formal procedures to develop and promulgate provisioning listings. Whatever listing is used should be formally coordinated with CECOM staff.
- Review spares management to ensure that <u>initial issue</u> assets are not being depleted by <u>replenishment</u>; initiate additional buys.

B.2 TSC-85/TSC-93 TACSAT

Conclusions

The TACSAT System (TSC-85 & TSC-93) is a totally different story from the GSC-52. Starting with a poor fielding plan and a maintenance concept based on an impossible O&O, the system is marginal and if not corrected, will soon develop difficulty in meeting its readiness requirement.

- Maintenance and O&O concepts vary by Command. In ISC units, GS is organic except in Korea where GS is at MSC (6th Support Center, Camp Carroll). For Corps Units in Europe, GS is at EAC; in CONUS it is at the Post, Camp or Station level. Variations in the O&O concept are creating nonresponsive maintenance support conditions.

- Provisioning was flawed in that it was based on an O&O concept that stated the TSC-85 would be deployed with Unit EMS. In Europe and Korea units with 16 Terminals were provided 10 sets of PLL which is dwindling rapidly.

- The fielding has been substandard in all units visited except the 112th Sig Co (Ft Bragg, Spec Ops). Ft Bragg (35th Sig Bde) created its own problems by requesting to keep systems without initial issue spares. USAISC units were directed to deploy only 50% of Terminals because of lack of replenishment spares support.

- Tech Manuals are considered confusing and incomplete, especially in troubleshooting. NET documentation is preferred.

- TMDE is deficient in units and particularly so based on current deployments in Europe and Korea. In part, this may reflect an ongoing transition of alignment tasks from GS to DS.

- TACSAT personnel (PM & Units) are unclear with regard to current authorizations for ERPSL and uncertain how to proceed in the ERPSL/MPL arena.

Recommendations

- Resolve conflict between support concept and the reality of deployments.

- Conduct post-provisioning review of ERPSL/PLL item selection, and adjust range and depth of stockage lists as required.

- Resupply is critical: bring units' PLL/ERPSL to maximum fill as soon as possible.

- Revise TMs to satisfy user requirements.

- Review TMDE authorizations and adjust to deployment by Theater.

- Add TACSAT to the MPDL and integrate it into the MPL process.

- Resolve the ERPSL/MPL authorization issue, integrate TACSAT into a formal Army process, and furnish guidance to units.

B.3 TTC-39/TYC-39 TRITAC SWITCHES

Conclusions

The TTC-39 & TYC-39 switches have a sparkling record of readiness in the field; but redundancy, intensive management at all levels and a loose system of readiness reporting mask some basic problems.

- The 36L repairman's school training is considered poor. The biggest complaints were no qualified instructors, not enough system-specific hours, not enough troubleshooting, etc. This was also a common complaint heard for other systems in this study.

- Assignment of the GS Maintenance function is confused. GS repair is being performed at the organic Bn level, at Corps, and at EAC. The Bn level is supported by initial issue of GS piece parts in the PLL. At the same time TPS for some TTC-39 cards have been developed for the MSM-105.

- The use of the MSM-105 for GS repair of TRITAC is also in a mixed bag. It is used in Germany, but not in Korea or Bragg. In Korea the -105 with the -39 TPS is totally committed to the VRC-12 program, and the -105 with available time and repair parts has no -39 TPS. Readiness is affected.

- Readiness reporting is highly subjective. In general, it is the Commander's call; due to redundant capability, most systems are reported "Green" unless they are totally off the air. In one unit, objective reporting criteria were locally established, but they are being disregarded there.

- The formal GTE Transfer of Knowledge Program seems to be providing significant technical upgrade for CECOM LARS, in contrast to what was seen in other systems.

- The USAF "Special Purpose Recoverables Authorized to Maintenance" (SPRAM) Program is an extension of the units ability to troubleshoot, and the program may have utility for the Army.

Recommendations

- CECOM should head a task force with DA and TRADOC to review and update the school POI for 36L, aligned with the MAC and DS/GS requirements.
- Clarify the GS maintenance assignments.
- Evaluate the readiness impact of the absence of any GS repair performed on TTC/TYC-39 Boards by either MSM-105 in Korea.
- Develop objective criteria for the readiness of the -39 switches, and promulgate positive guidance to all users.
- Evaluate the GTE Transfer of Knowledge Program for the switches and its applicability to other programs.
- Expedite and oversee the development of the TRITAC Switch MPL.
- Evaluate the Air Force's SPRAM program for use in TRITAC or MSE.

B.4 MLQ-34 TACJAM

Conclusions

This is a classic example of inadequate ILS planning and ingrained Contractor Logistic Support. It is the only system identified by users as unreliable and with a poor readiness history.

- The design marriage of the M-1015 and the TACJAM System is a disaster: TACJAM O&O requires high mobility, but M-1015 reliability negates the O&O.

- Initial provisioning of TACJAM LRUs was low. EMRA still owes the field the balance of the IIQ. Replenishment procurement has been practically nonexistent. This under-provisioning leads to increased pressure for In-theater repair and strengthens contractor involvement.

- The TACJAM program has the largest mismatch between maintenance personnel requirements and the quality and quantity of the school output. They are understrength and overqualified for the DS mission.

- HQDA (DCSPER) states it is impossible to provide the Army with sufficient numbers of MOS 33. They support continued CLS.

- TPSs are being developed for the MLQ-34 to run on IGS ATE -- the MSM-105. The TPS decision was made without the benefit of lessons learned from other systems' use of TPSs: see *Table IV-1*.

Recommendations

- Replace the M-1015 prime mover with the Bradley Vehicle or other suitable substitute.

- Correct known deficiencies in the fielding process worldwide; complete the provisioning process and implement the Interim Contractor Support Transition Plan.

- Review and clarify MAC. Distinguish between operator and maintenance tasks on- and off-equipment. Realign POI for MOS 33T and 98G as a result of review. Include track vehicle operator maintenance in MOS 98G.

- CECOM should anticipate continued contractor support. It should also anticipate the potential for configuration management and support problems stemming from the AEL second production of TACJAM.

- CECOM should review the TPS decision and status to determine if the decision is cost effective and supports the readiness objective.

B.5 IMPROVED GUARDRAIL-V

Conclusions

IGR-V has the most nonstandard support system the team encountered: the "system" includes all echelons of maintenance on site, plus multiple contractors. It has the lowest density in the samples (2 worldwide) and if there is a role for continued and total CLS, this is the system on which to evaluate it.

- COEA is called for in the ILSP to optimize Logistic Support. The situation clearly demands a COEA, but there is no evidence it was ever done.

- One essential factor in such a COEA is a consideration of O&O implications. The IGR-V is currently employed at 50% of full TO&E capability.

- Delineation of the MAC responsibilities is difficult because of bundling of contractor and DA civilian resources with soldiers, and go-to-war capability is uncertain; but the GRV unit in Korea believes it could go to war without Contractor or SAAD support, although spares would limit sustainability.

- IGR-V is thinly provisioned in range and depth. The consequences are increased pressures to repair and more contractor support.

- The system is being fielded short certain prime mission equipment. This leads to regular component swapping and maintenance workarounds.

- IGR-V PME is not readiness reportable. Readiness is unknown at CECOM.

Recommendations

- CECOM should use the IGR-V and follow-on systems (Common Sensor) as a test bed to evaluate the concept of prolonged and total contractor support for low density, critical mission systems in peacetime and wartime.

- A COEA should be performed on the system as the starting point for the evaluation recommended in above paragraph.

- Review spares levels at unit and depot to insure availability of mission critical items.

- Correct the very serious shortfalls in prime mission equipment components to insure full capability.

- Complete and regular readiness reporting to CECOM on IGR-V and GRV PME should be established.

8.6 ASN-86 INERTIAL NAVIGATION SET

Conclusions

The ASN-86 is the oldest hardware studied by the team. Despite some attitudes at CECOM that the system was very difficult to maintain, the team found users who shared different views. The problems with the ASN-86 derive from the technology and from the difficulties in procuring components for replacement and repair.

- There are serious shortfalls in wholesale supply that put pressure on finding supply workarounds at the retail level. LRUs are not authorized as spares on the PLL. Units rely on excess ASN-86s at the flight line and contractor repair on-site.

- All three LRUs of the ASN-86 are cataloged as Class-II (property-book accountable items) rather than as Class-IX spare parts. This puts an added burden of supply management on field units.

- Reported voltage fluctuation in OV-1D applications results in added demand on NCU maintenance and supply.

- Some field units report that the approved special test sets (ASM-385 and ASM-386) are inadequate for the AVIM repair mission, and they use "hot mock-up" sets instead. However, these hot mock-ups are nonstandard and offer only incomplete test capability.

- All sites surveyed have dedicated on-site contractor field service representatives to assist in the repair of ASN-86s.

Recommendations

All recommendations herein must be tempered by assessment of remaining useful life of the ASN-86 set.

- Determine the requirement for LRU spares and authorize their stockage.

- Review the rationale for assigning ASN-86 LRUs to supply Class-II, and change to Class-IX if appropriate.

- Investigate the reported system incompatibility between the ASN-86 and the RV-1D.

- Conduct an engineering assessment of the three principal test sets (ASM-385, ASM-386, and the hot mock-up) to validate their utility, and determine the potential for improved fault-isolation techniques and hardware.

- Reassess the requirement for on-site contractor support.

Appendix 1: STUDY METHODOLOGY

A seven-step methodology was followed in the conduct of this study:

Step 1: Define a conceptual framework for the study.

Table A1-1 presents the conceptual framework. As noted therein, the study approach focused on three aspects of logistic support:

Design-for-Supportability

System Support Structure

Readiness

Step 2: Amplify the framework with specific questions that focus on the particulars of logistic support.

Table A1-2 lists amplifying questions used in pursuit of data.

Step 3: Identify the specific logistic support variables that must be analyzed.

Table A1-3 identifies the specific factors in logistic support that were targeted for data input and analysis.

Step 4: Identify the prime sources of information that can respond to these questions.

Table A1-4 lists the sources of data around which the data collection plan was built.

Step 5: Collect the data.

Table A1-5 lists the specific commands, activities, and units visited by the team in pursuit of information. Personal contact was made with elements of TRADOC, FORSCOM, USAREUR, Eighth US Army, Information Systems Command, AMC, and HQDA.

Step 6: Organize and analyze the data.

Step 7: Present an assessment of the findings and develop recommendations and conclusions.

Table A1-1. Low-Density System Support Factors

1. System Design-for-Supportability

- Reliability
- Maintainability
  - -- Modular Design
  - -- Testability
  - -- BIT/BITE
  - -- Accessibility / HFE
- Commonality
- Price
- Complexity / Technology
- ORLA (where/if repaired)
- Readiness goal
- Density and its influence

2. System Support Structure

A. Maintenance: (Planned + Actual) x (Depot + IGS + IDS + Unit)

- O&O
  - -- Personnel (Military, Civilian, Contractor, Vendor)
  - -- MOS
  - -- ORLA
- Training
- MAC
- Tech Manuals
- Test Equipment
- BIT/BITE
- Tools
- Maintenance Workload
- Maintenance Performance
- Maintenance Cost

B. Supply: (Planned + Actual) x (Wholesale + Retail)

- Cataloging
- Initial Supply
- Resupply Management
- Computer Systems
- Supply Requirements
- Supply Performance
- Supply Cost

3. Readiness (Planned + Actual)

- Operational Availability
- Mobility
- Other

Table A1-2. Questions to be Answered by Managers, Users, and Supporters

- What system and support capabilities did the Army intend to buy?
  - What effect did that have on the approach to logistics?

- What did the system and its support turn out to be?
  - What deviations were there from the plan?
  - What were the impacts of such deviations?

- What changes are recommended to improve
  - Current low-density system support?
  - Future low-density system supportability and support?
  - Support policies, procedures, and processes?

Table A1-3. Specific Variables to be Analyzed

1. System Design-for-Supportability

- Reliability	- MTBF (MTBUMA, MTBOMF, ...)
- Maintainability	- How many "LRUs" vs. "Modules" & "SRUs" - Are they accessible (HFE)? - Does BIT/BITE address all? - Is testability complete?
- Commonality	- Internal / External
- Price	- End Item / LRU / SRU / Part
- Complexity/Technology	- Maturity of Technology - Complexity re: Operator/Maintainer
- ORLA	- Maintenance Allocation - Repair/Discard - Replacement (what/where/how) - ORLA runs/results, if any
- Readiness Goal	- Ao (other, if specified)
- Density	- Acquisition/Deployment quantities

2. System Support Structure

A. Maintenance

- O&O	- O&O
- Training	- School vs. OJT - Training devices
- MAC	- Echelons of maintenance - Workload/task distribution by echelon
- Tech Manuals	- What echelons, types, audience? - How current?
- Computer Systems	- CCSS (PMR completeness, accuracy, ...) - Other (TAMMS, SAMS, ...)
- Test Equipment	- Special and General - Automatic and Manual
- BIT/BITE	- How extensive? Too little? Too much? - How deep into the system? - Reliability
- Tools	- Special and General (which, if special?)
- Maintenance Workload	- Frequency of scheduled/unscheduled maintenance - Duration (elapsed) and manhours - Skill levels, task complexity - Other?
- Maintenanre Performance	- Recovery rate - Turnaround time - NMCM rate - Other?
- Maintenance Cost	- Dollars, Personnel, Facilities

Table A1-3. Specific Variables to be Analyzed (Continued)

2. System Support Structure (Continued)

B. Supply

- Cataloging	- Old/new items? - PTD complete? - Online/offline? - Extent & quality
- Initial Supply	- Basis of requirements (SIP, SESAME, ...) - Adequacy of budget - Distribution of initial assets (ASL/PLL/Depot) - Method of initial distribution
- Resupply Management	- Online/offline management - Standard (demand-based) vs. exception management - Adequacy of budget and assets - Requirements forecasting - Reprocurability - Correlation of supply and maintenance
- Computer Systems	- Data bases (completeness, accuracy, ...) - Logic (processing rules) - Reports (in support of maintenance/supply) - Input/Output capability
- Supply Requirement	- Spares demand - Item management intensity - Stockage weight/cube/lines - Other?
- Supply Performance	- Order/ship time - Supply availability - NMCS rate - Other?
- Supply Cost	- Dollars, Personnel, Facilities

3. Readiness (Planned + Actual)

- Operational Availability
- Mobility
- Other

Table A1-4. Sources of Data Collection

1. System Design-for-Supportability	PM CECOM O&M Contractor
2. System Support Structure	
A. Maintenance	PM CECOM O&M TRADOC Contractor
B. Supply	CECOM PM O&M Log Center DA AMC
3. Readiness	DA AMC PM CECOM O&M

Table A1-5. Organizations Included in Survey Visits

HQ, Department of the Army

US Army ODCSLOG

HQ, US Army Materiel Command

US Army Inventory Research Office

HQ, US Army CECOM

Functional Managers

- Materiel Management Directorate (DMM)
- Maintenance Engineering Directorate (DME)
- Procurement Directorate (DPC)
- Readiness Directorate (DRE)
- Production and Manufacturing Technology Directorate (P&MT)
- ILS Directorate (ILSD)

Project Management Offices

- Project Manager, SATCOMA
- Project Manager, MSCS
- Project Manager, Guardrail
- Project Manager, Signal Warfare

EW/RSTA Center

HQ EMRA

US Army TRADOC

- USA Logistics Center
- USA Ordnance Center and School
- USA Signal Center and School
- USA Intelligence Center and School

US Army Information Systems Command

1st Signal Brigade

- 304th Signal Battalion
- 36th Signal Battalion
- 229th Signal Company

5th Signal Command

- 72d Signal Battalion
- 73d Signal Battalion

Fort Meade Satellite Communications Center

Table A1-5. Organizations Included in Survey Visits (Continued)

US Army Forces Command

- XVIII Airborne Corps
  - 35th Signal Brigade
    - 50th Signal Battalion
    - 35th Signal Battalion
    - 327th Signal Battalion
    - 426th Signal Battalion
  - 224th Military Intelligence Battalion (AE)
  - 58th LEM
  - 503rd Maintenance Company
- 24th Infantry Division
  - 124th Military Intelligence Battalion (CEWI)
- 1st Special Operations Command
  - 112th Signal Company

US Army Europe

- HQ, USAMC Europe
- HQ, 200th TAMMC
- 93rd Signal Brigade
  - 26th Signal Battalion
  - 34th Signal Battalion
  - 51st Signal Battalion
- 8th Infantry Division
  - 108th Military Intelligence Battalion (CEWI)
- 1st Military Intelligence Battalion (AE)
- 21st Support Command
  - General Support Center, Pirmasens (GSCP)

Eighth US Army

- HQ, USAMC Far East
- 2nd Infantry Division
  - 122nd Signal Battalion
  - 2nd DISCOM
    - 702nd Maintenance Battalion
- 19th SUPCOM
  - 227th Maintenance Battalion
    - 595th Maintenance Company
      - AN/MSM-105
  - 194th Maintenance Battalion
    - 520th Maintenance Company
  - 6th Support Center
    - AN/MSM-105
- 3rd Military Intelligence Battalion (AE)

US Air Force, Korea

- 6140th Tactical Communications Flight (Osan Air Force Base)

Appendix 2: REGULATORY REFERENCES

Appendix 2: REGULATORY REFERENCES

Reference was made to several regulations in the body of the report. Below are the references and pertinent quotes.

AR 700-4. "Logistic Assistance Program"

Para 2.4 is interpreted as prohibiting active LAR involvement in routine maintenance support.

The issue is the definition of "routine." Does that include emergency maintenance?

Para 3.3 limits use of CLS to one year.

AR 700-127. "Integrated Logistic Support" (3/1/88 Update)

Chapter 5 contains guidance on contractor support. Para 5.3 states:

- "The decision to use contractor support requires trade-off analysis as part of the LSA process;
- It must be "optimum among feasible alternatives", it must "provide the required support in both peacetime and wartime scenarios", and "must be the most cost-effective method"; and
- "Wartime mission and deployment requirements will be the primary considerations on which support risks are based."

This guidance is new with the March 1988 update of AR 700-127. The study team found no evidence that ICS/CLS choices for the sample systems were made on the basis of such analysis.

AR 700-138. "Army Logistics Readiness and Sustainability" (12/17/86)

Para 4.2 (Table 4-3) establishes materiel goals for RC-12D (IGR-V) aircraft as 80% Mission Capable (without PME) and 70% Fully Mission Capable (with PME).

AR 710-1. "Centralized Inventory Managment of the Army Supply System"
CCSS Operating Instruction 18-710-102, Vol. 3, Appendix A.

Describes wholesale demand-support criteria for stockage qualification, including "COSDIF" logic.

AR 710-2. "Supply Policy Below the Wholesale Level"

Para 3-8b(4) states: "These items <u>will</u> be added to the ASL when they appear on one or more customer MPLs or shop stock. They will be removed from the ASL when they are deleted from all customers' MPLs or shop stock."

DoD Directive 4140.44. "Supply Management of the Intermediate and Consumer Levels of Inventory"

Para D(2)d states: "Stockage of items at the consumer level of inventory on other than a demand basis will be minimized to the degree that operational considerations permit. When stockage of nondemand supported items...is required at the consumer level, supporting stockage at the intermediate level for the same item will normally be on a demand supported basis."

This paragraph seems to contradict the previous AR 710-2 reference.

AR 750-1. "Army Materiel Maintenance Policies"

Para 2-1(f) prescribes that "repair will be minimized at lower levels of maintenance by prioritizing the concept of discard at failure."

The study team found no evidence of compliance with this policy in equipment design.

Para 2-3(b) defines MAC as "primary tool for assigning tasks to maintenance levels; then states user experience may be used to temper the MAC."

Para 2-5(b) authorizes commanders to compromise the discipline of three-level maintenance by authorizing "the supported unit or IDS activity to perform the next higher level of maintenance."

Para's 2-3(b) and 2-5(b) seem to give license to commanders to maintain their equipment in the manner they prefer, rather than by a specified set of rules.

Para 3-24 requires that "CLS be limited to short term tasks."

Para 3-26 "prohibits use of civilian maintenance personnel forward of the Corps rear boundary in contingency planning."

The study team found no evidence that these policies are enforced.

GLOSSARY OF ABBREVIATIONS

GLOSSARY OF ABBREVIATIONS

This glossary explains each abbreviation used in this report, together with paragraph and page reference to its definition or first use.

Abbreviation or Special Term	*Meaning*	*Used in this Report Paragraph*	*Page*
AE	*Aerial Exploitation*	III.E.6(b)	III-22
AEB	*Aerial Exploitation Battalion*	III.E.5(c)	III-20
AEL	*A E L Service Corporation*	V.B.4	V-12
AGE	*Auxiliary Ground Equipment*	III.E.5(b)	III-19
AIMI	*Aviation Intensively Managed Item*	III.E.6(c)	III-23
AIT	*Advanced Individual Training*	III.B	III-3
AMC	*US Army Materiel Command*	IV.B.2	IV-8
AMDF	*Army Master Data File*	IV.B.6(b)	IV-20
AMSF	*Area Maintenance and Supply Facility*	III.C	III-5
Ao	*Operational Availability*	Table A1-3	A1-4
ARCSIP	*Automated Requirements Computation System - Initial Provisioning*	IV.B.4(b)	IV-14
ARI	*Automatic Return Item*	IV.C.5(b)	IV-31
ASI	*Additional Skill Identifier*	IV.C.1(a)	IV-24
ASL	*Authorized Stockage List*	II.A	II-2
ATE	*Automatic Test Equipment*	III.E.4(b)	III-17
AUTODIN	*Automatic Digital Network*	IV.B.2(b)	IV-10
AVIM	*Aviation Intermediate Maintenance*	III.E.5(c)	III-20
AVSCOM	*US Army Aviation Systems Command*	III.E.5(c)	III-20
AVUM	*Aviation Unit Maintenance*	III.E.6(b)	III-22
BASI	*Beech Aerospace Services Inc.*	III.E.5(c)	III-20
BIT	*Built-in-Test*	II.B.3	II-7

Abbreviation or Special Term	Meaning	Used in this Paragraph	Report Page
BITE	*Built-in-Test Equipment*	II.B.3	II-7
C^3I	*Command, Control, Communications and Intelligence*	I	I-1
CCA	*Circuit Card Assembly*	IV.B.4(c)	IV-15
CCSS	*Commodity Command Standard System*	III.E.1(c)	III-7
C/E	*Communications/Electronics*	I	I-1
CECOM	*US Army Communications-Electronics Command*	I	A1-1
CEWI	*Combat Electronic Warfare Intelligence*	IV.C.1(a)	IV-23
CICA	*Competition in Contracting Act*	IV.B.3	IV-11
CIF	*Candidate Item File*	IV.B.6(b)	IV-21
CIU	*Control-Indicator Unit*	III.E.6(c)	III-22
CLS	*Contractor Logistic Support*	III.B	III-3
C.O.	*Commanding Officer*	V.B.1	V-8
COEA	*Cost and Operational Effectiveness Analysis*	IV.B.4(d)	IV-16
CONUS	*Continental United States*	III.E.2(b)	III-9
COSCOM	*Corps Support Command*	IV.C.3	IV-28
COSDIF	*Cost Differential Analysis*	IV.B.1(a)	IV-4
CY	*Calendar Year*	III.E.2(c)	III-12
DCA	*Defense Communications Agency*	III.E.1(d)	III-8
DCSLOG	*Deputy Chief of Staff for Logistics*	IV.B.6(b)	IV-19
DCSPER	*Deputy Chief of Staff for Personnel*	IV.C.1(a)	IV-23
DLA	*Defense Logistics Agency*	IV.B.4(b)	IV-14
DMM	*Directorate of Materiel Management*	IV.B.1	IV-2
DOL	*Director of Logistics*	III.C	III-5

Abbreviation or Special Term	Meaning	Used in this Report Paragraph	Page
DS	*Direct Support*	III.E.1(b)	III-7
DS4	*Direct Support Unit Standard Supply System*	III.C	III-5
DX	*Direct Exchange*	III.C	III-5
DX-CEM	*Direct Exchange Communication-Electronics Missile*	IV.C.5(b)	IV-32
EAC	*Echelons Above Corps*	III.E-2(b)	III-10
EMRA	*Electronic Materiel Readiness Activity*	III.E.4(b)	III-17
EMS	*Electronic Maintenance Shop*	III.E.2(a)	III-9
ERPSL	*Essential Repair Parts Stockage List*	III.C	III-5
EUCOM	*European Command*	III.E.2(b)	III-10
EUSA	*Eighth US Army*	IV.C.1(a)	IV-23
EW	*Electronic Warfare*	II.C	II-28
FIA	*Financial Inventory Accounting*	V.A.8	V-6
FMC	*Fully Mission Capable*	III.E.5(d)	III-21
FMT	*Field Maintenance Technician*	IV.C.1(d)	IV-26
FOE	*Follow-on Evaluation*	IV.B.4(b)	IV-15
FRG	*Federal Republic of Germany*	III.E.2(b)	III-10
FY	*Fiscal Year*	IV.B.1	IV-3
FYDP	*Five-Year Defense Plan*	IV.B.4(b)	IV-14
GDP	*General Defense Plan*	III.E.2(b)	III-10
GI	*Government Issue*	III.E.4(a)	III-16
GRV	*Guardrail V*	III.E.4(c)	III-20
GS	*General Support*	III.E.1(b)	III-7
GSCP	*General Support Center, Pirmasens*	Table A1-5	A1-7
GSPU	*Gyro Stabilized Platform Unit*	III.E.6(c)	III-22

Abbreviation or Special Term	Meaning	Used in this Report Paragraph	Page
GTE	*General Telephone and Electronics Co.*	IV.C.1(e)	IV-26
HDV	*High Dollar Value*	IV.B.1(b)	IV-5
HFE	*Human Factors Engineering*	Table A1-1	A1-1
HQDA	*Headquarters Department of Army*	I	A1-1
HVPS	*High Voltage Power Supply*	III.E.2(b)	III-10
ICS	*Interim Contractor Support*	III.A.2	III-2
IDS	*Intermediate Direct Support*	III.A.2	III-3
IEW	*Intelligence and Electronic Warfare*	II.B.2	II-6
IG	*Inspector General*	IV.B.4(c)	IV-15
IGR-V	*Improved Guardrail-V*	I	I-1
IGS	*Intermediate General Support*	III.C	III-5
IIQ	*Initial Issue Quantity*	V.B.4	V-11
IL&FM	*Installations, Logistics, and Financial Management*	IV.C.1(d)	IV-26
ILS	*Integrated Logistics Support*	IV.B.2	II-6
ILSP	*Integrated Logistics Support Plan*	V.B.5	V-12
INS	*Inertial Navigation System*	III.E.6(c)	III-23
IPF	*Integrated Processing Facility*	IV.C.3	IV-28
IRO	*US Army Inventory Research Office*	IV.B.1(b)	IV-5
J&A	*Justification and Approval*	IV.B.3	IV-11
JLSP	*Joint Logistic Support Plan*	III.E.5(c)	III-20
Joint STARS	*Joint Surveillance Target Attack Radar System*	I	I-1
KW	*Kilowatt*	III.E.4(a)	III-16
LAR	*Logistic Assistance Representative*	III.B	III-3
LDV	*Low Dollar Value*	IV.B.1(b)	IV-5

Abbreviation or Special Term	Meaning	Used in this Paragraph	Report Page
LEM	*Light Equipment Maintenance*	IV.C.1(a)	IV-24
LRIP	*Low Rate Initial Production*	III.E.2(c)	III-11
LRU	*Line Replaceable Unit*	III.C	III-4
LSA	*Logistic Support Analysis*	IV.A	IV-2
MAC	*Maintenance Allocation Chart*	III.B	III-4
MAT CAT	*Materiel Category*	IV.C.5(b)	IV-32
MC	*Mission Capable*	III.E.5(d)	III-21
MDV	*Medium Dollar Value*	IV.B.1(b)	IV-5
MI	*Military Intelligence*	III.E.4(c)	III-17
MOS	*Military Occupational Specialty*	II.B.2	II-6
MPDL	*Mission Profile Development List*	IV.B.6	IV-17
MPL	*Mandatory Parts List*	IV.B.6(b)	IV-19
MRSA	*Materiel Readiness Support Activity*	IV.B.6(b)	IV-19
MSC	*Major Subordinate Command*	V.B.2	V-9
MSCS	*Multi-Service Communications Systems*	Table A1-5	A1-7
MSE	*Mobile Subscriber Equipment*	V.B.3	V-10
MTBF	*Mean Time Between Failures*	Table A1-3	A1-4
MTBOMF	*Mean Time Between Operational Mission Failure*	Table A1-3	A1-4
MTBUMA	*Mean Time Between Unscheduled Maintenance Actions*	Table A1-3	A1-4
MTDA	*Modified Table of Distribution and Allowances*	IV.B.6	IV-17
MUX	*Multiplexer*	III.E.2(b)	III-[illegible]
NCU	*Navigation Computer Unit*	III.E.6(c)	III-2[illegible]
NET	*New Equipment Training*	III.E.1(b)	III-[illegible]

Abbreviation or Special Term	Meaning	Used in this Report Paragraph	Page
NICP	*National Inventory Control Point*	III.E.5(c)	III-20
NMCM	*Not Mission Capable, Maintenance*	Table A1-3	A1-4
NMCS	*Not Mission Capable, Supply*	IV.B.2(a)	IV-9
NSN	*National Stock Number*	III.E.1(c)	III-7
OJT	*On-the-Job Training*	III.B	III-3
O&M	*Operation and Maintenance*	Table A1-4	A1-6
O&O Concept	*Operational and Organizational Concept*	III.E.2(b)	III-10
ORG	*Organization*	IV.C.1(e)	IV-26
ORLA	*Optimum Repair Level Analysis*	III.E.2(b)	III-10
OSD	*Office of the Secretary of Defense*	IV.B.2	IV-8
PC	*Personal Computer*	IV.B.6(a)	IV-18
PCB	*Printed Circuit Board*	III.A.2	III-2
PCS	*Permanent Change of Station*	III.E.2(b)	III-10
PLISN	*Provisioning List Item Sequence Number*	IV.B.4(a)	IV-12
PLL	*Prescribed Load List*	II.B.2	II-6
PM	*Program/Project/Product Manager*	III.C	III-5
PMO	*PM Office*		
PME	*Prime Mission Equipment*	III.E.5(c)	III-20
PMOS	*Primary Military Occupational Specialty*	IV.C.1(b)	IV-24
PMR	*Provisioning Master Record*	IV-B.6(b)	IV-21
POI	*Program of Instruction*	V.A.6	V-4
PPL	*Provisioning Parts List*	IV.B.4(a)	IV-12
PROLT	*Procurement Lead Time*	IV.B.1(b)	IV-6
PTD	*Provisioning Technical Documentation*	V.A.6	V-4

Abbreviation or Special Term	Meaning	Used in this Report Paragraph	Page
RAM	*Reliability, Availability and Maintainability*	III.A	III-1
RDES	*Requirements Determination and Execution Subsystems*	IV.B.4(b)	IV-14
RO	*Requisition/Requirements Objective*	IV.B.1(b)	IV-6
ROC	*Required Operational Capability*	IV.B.6(b)	IV-22
RPM	*Revolutions per Minute*	III.E.4(a)	III-16
RX	*Reparable Exchange*	IV.B.2(b)	IV-10
SAAD	*Sacramento Army Depot*	III.B	III-3
SAILS	*Standard Army Intermediate Level Supply System*	IV.C.5(b)	IV-32
SAMS	*Standard Army Maintenance System*	Table A1-3	A1-4
SARSS	*Standard Army Retail Supply System*	III.C	III-5
SATCOM	*Satellite Communications*	V.B.1	V-85
SATCOMA	*Satellite Communications Agency*	III.E.2(b)	III-10
SESAME	*Selected Essential-Item Stockage for Availability Method*	II.A III.E.1(c)	II-2 III-8
SETAF	*Southern European Task Force*	III.E.2(b)	III-10
SIEW	*Signals Intelligence Electronic Warfare*	III.E.4(c)	III-17
SIGINT	*Signals Intelligence*	II.C	II-8
SIP	*Standard Initial Provisioning Model*	Table A1-3	A1-4
SLAC	*Support List Allowance Card*	III.E.4(c)	III-17
SLAR	*Side Looking Airborne Radar*	III.E.5(d)	III-21
SOW	*Statement of Work*	V.A.9	V-7
SPRAM	*Special Purpose Recoverables, Authorized to Maintenance*	III.E.3(b)	III-13
SRA	*Specialized Repair Activity*	III.C	III-5

Abbreviation or Special Term	Meaning	Used in this Report Paragraph	Page
SRU	*Shop Replaceable Unit*	III.E.4(c)	III-17
SSA	*Supply Support Activity*	III.C	III-5
STE	*Special Test Equipment*	III.E.4(b)	III-17
TACFIRE	*Tactical Fire Direction System*	IV.C.5(b)	IV-31
TACJAM	*Tactical Jammer*	I	I-1
TACSAT	*Tactical Satellite Systems*	I	I-1
TAG	*The Adjutant General*	III.E.1(a)	III-7
TAMMS	*The Army Maintenance Management System*	Table A1-3	A1-4
TDA	*Tables of Distribution and Allowance*	IV.C.1	IV-23
TDP	*Technical Data Package*	IV.B.3	IV-11
TDY	*Temporary Duty*	IV.C.1(b)	IV-24
TMDE	*Test, Measurement and Diagnostic Equipment*	III.A.2	III-3
TOE	*Table of Organization and Equipment*	III.E.5(a)	III-19
TPS	*Test Program Set*	III.E.4(b)	III-17
TRADOC	*US Army Training and Doctrine Command*	I	A1-1
TRITAC	*Joint Tactical Communications System*	I	A1-1
TSSP	*Tactical Satellite Signal Processor*	III.E.2(b)	III-10
USAF	*US Air Force*	V.B.3	V-10
USAISC	*US Army Information Systems Command*	III.E.1(d)	III-8
USALOGC	*US Army Logistic Center*	IV.C.5(b)	IV-24
USAREUR	*US Army Europe*	I	A1-1
WRSK	*War Reserve Spares Kit*	III.E.3(b)	III-14

Appendix J

National Security Industrial Association draft Study Report, Jul 91, Subj: NSIA COTS/NDI Study

GEN THOMAS

DRAFT

NSIA COTS/NDI STUDY

JULY 1991

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APPENDIX A: TERMS OF REFERENCE: COMMERCIAL OFF-THE-SHELF/ NONDEVELOPMENTAL ITEM (COTS/NDI) STUDY

APPENDIX B: NSIA COTS/NDI STUDY TEAM

APPENDIX C: MEETINGS/BRIEFINGS

EXECUTIVE SUMMARY

An NSIA Team undertook a study to evaluate the effectiveness of the Army's Acquisition, fielding, and sustainment strategy for Commercial Off-the Shelf (COTS)/Nondevelopmental Item (NDI) systems of the U.S. Army Communications and Electronics Command (CECOM) and the Information Systems Management Agency (ISMA) and to recommend changes.

The Study Team concluded that in spite of Congressional direction to expand COTS/NDI applications and in spite of DoD urging the Army to adopt commercial practices in the electronics area, there has been no substantial change in the way the Army, and CECOM in particular, conducts its acquisition business. COTS/NDI acquisition, fielding, and sustainment frequently follow the developmental approach, thus frustrating industry and substantially delaying the fielding of such equipment, not to mention the increased costs involved.

Key barriers to COTS/NDI are:

- Accounting requirements and reviews
- Military specifications and standards
- Technical data rights and documentation
- Army regulations
- Army bureaucracy
- Inadequate relationships between the field user, the combat developer (Signal School), the materiel developer (CECOM), and the contractor
- Reluctance to grant greater contractor logistical support
- Excessive testing
- Absence of a risk taking philosophy
- A mindset that is reluctant to change

The Study Team assessed the COTS/NDI environment in seven areas: General, requirements, hardware engineering, software engineering, integrated logistics support, testing, and program management. The major conclusions reached by the Study Team are reflected below:

- Uncontrolled requirements impede a COTS/NDI solution.

- Detailed military specifications do the same.

- The level of experience in the combat developments community precludes progress.

- The user and developer should operate more as a team.

- A cultural change at CECOM is difficult.

- Contractor support is not encouraged.

- General officer support is required to overcome bureaucratic resistance.

- A new Agency regulation on NDI procedures is required.

- More commercial and international standards should be used.

- RFPs should be tailored for COTS/NDI.

- CECOM should foster more creative solutions by industry.

- Policies for software procurement and changes should be flexible and clearly defined.

- Provisioning should be identified early on and follow a streamlined process.

- Existing vendor manuals and documentation should be used.

- Performance trade-offs should be made to gain a cost effective and early system fielding.

- Warranties on commercial products should preclude qualification testing.

- Testing procedures should be significantly modified for COTS/NDI.

- Government and contractor PMs should be given greater responsibility and authority.

- Reviews should be drastically reduced.

- Modifications to CDRLs after contract award should be permitted.

- More disciplined up-front planning should be established to preclude costly fielding delays.

- The acquisition community should be educated on COTS/NDI processes, procedures, and benefits.

- Senior Army leadership in support of COTS/NDI is necessary.

- The Army's mindset on COTS/NDI should be changed.

INTRODUCTION

PURPOSE

The purpose of this report is to provide the results of the National Security Industrial Association (NSIA)-sponsored study to evaluate the effectiveness of the Army's acquisition, fielding, and sustainment strategy as it applies to Commercial Off-the-Shelf (COTS)/Nondevelopmental Item (NDI) systems of the U.S. Army Communications and Electronics Command (CECOM) and the Information Systems Management Agency (ISMA) and to recommend changes to improve its effectiveness and efficiency.

SCOPE

As derived from the Terms of Reference provided by the Command, Control, Communications, and Intelligence Committee (C[3]IC) of the NSIA (see **Appendix A**), the tasks for the study effort are as follows:

- To provide industry's perspective on how the Army can improve its acquisition, fielding, and sustainment of COTS/NDI systems.

- To evaluate the current method of COTS/NDI acquisition by exploring the role of the contractor in improving the acquisition, fielding, and sustainment of low-density equipment.

- To identify current procedures for a minimum of two COTS/NDI acquisitions, to include both hardware and software, and to evaluate their effectiveness.

- To develop an action plan for an enhanced COTS/NDI acquisition, fielding, and sustainment process, or, at a minimum, provide recommendations for improvement.

- To determine how contractor-supported systems should be transitioned to organic support, if applicable, and to identify policies and procedures that should be changed to reflect this transition.

METHODOLOGY

To initiate the study effort, the NSIA formed a team of eight personnel representing eight of its corporate members. A Chairman and Deputy Chairman were selected. A CECOM representative joined the team. Its membership is shown in Appendix B.

The Study Team held an initial meeting at CECOM, Fort Monmouth, NJ, on September 28, 1990, to be briefed on CECOM's views on COTS/NDI matters, to include case studies of the Mobile Subscriber Equipment (MSE) program and the Common Hardware/Common Software (CHS) program. At the conclusion of the meeting, the Chairman assigned to each Team member the task of preparing a paper in response to three questions. The responses were to reflect the participating individuals' and their companies' views based on experience factors in doing business with the Army—CECOM, in particular. Those three questions were as follows:

- What should CECOM and the Army *continue* to do in regard to COTS/NDI?

- What should CECOM and the Army *stop* doing in regard to COTS/NDI?

- What should CECOM and the Army *start* doing in regard to COTS/NDI?

At a second Team meeting held at Burdeshaw Associates, Ltd., (BAL) in Bethesda, MD, November 26, 1990, the Study Team met to review the individual inputs to the three questions. That session resulted in a consolidation of issues and suggestions into the following specific areas of interest: Requirements, Hardware and Software Engineering, Integrated Logistics Support (ILS), Testing, and Program Management. Each of these subject areas was assigned to a Team member to further refine and develop into a section of the final report. These subject areas form the basis for the Assessment section of this report.

At a third Team meeting held at Magnavox, Torrance, CA, on March 19, the Team reviewed a draft of the assessment section of the report and followed with adjustments, additions, and refinements. Following this meeting, the two case studies were developed and the lessons learned incorporated in this report.

During the period of the study effort, the Chairman and other Team members met with individuals and agencies having an interest in the subject of COTS/NDI. These inputs and views have been incorporated in the Team's assessment. A listing of these meetings and briefings is shown in Appendix C.

This final report was developed during April, May, and June 1991 and subsequently presented to the C^3I Committee of the NSIA for review and comment.

BACKGROUND

FEDERAL GOVERNMENT ROLE

The idea that the federal government could benefit by purchasing commercial products has been advanced for many years. In 1972, the Commission on Government Procurement first emphasized the need for a shift in fundamental philosophy by recommending that the government buy more commercial products, rather than rely on products designed to meet unique government specifications or purchase descriptions. The impetus for this shift was the high cost of developing products to meet detailed government specifications and of duplicating existing commercial distribution systems.

In 1976, recommendations of the Commission on Government Procurement became policy when the Office of Federal Procurement Policy (OFPP) issued a series of memoranda governing procurement of commercial products. The memoranda stated that the government should purchase commercial off-the-shelf products whenever they would adequately serve the government's requirements and that the government should use commercial distribution channels in supplying commercial products to its users. The policy implied that detailed specifications were not needed to ensure the quality of an item that had been accepted in the marketplace, and that the government should be able to establish performance and reliability of a commercial product through an effective market research effort.

DEPARTMENT OF DEFENSE ROLE

In 1976, DoD implemented an effort, the Acquisition and Distribution of Commercial Products (ADCOP) Program, which was designed to unite previous DoD commercial buying efforts under one program. This program's objectives included (a) emphasizing the acquisition of commercial products to meet DoD requirements, (b) eliminating unnecessary government specifications, (c) tailoring essential specifications to reflect commercial practices, and (d) minimizing the administrative burden of government acquisition procedures.

In 1977, DoD established the Commercial Commodity Acquisition Program (CCAP) to document cases of commercial acquisition accomplished without detailed specifications. In 1978, concepts from the DoD programs and the OFPP memoranda were incorporated into DoD Directive 5000.37, "Acquisition and Distribution of Commercial Products" as they applied to military applications.

Along with commercial product emphasis for DoD support items in the mid- and late 1970s, there was a shift toward looking more carefully at commercial and foreign materiel for weapon systems, subsystems, and components. The Army subsequently issued a policy encouraging consideration of domestic or foreign

commercial items as an alternative to new development, calling them Nondevelopmental Items (NDI). In 1984, the Army published an NDI Handbook outlining procedures for tailoring the standard weapons acquisition process for NDI acquisition strategies and devoted two chapters to NDI in Army Regulation 70-1 "Systems Acquisition Policy and Procedures," the Army's capstone acquisition regulation. Also, in 1985 the Commanding General, Army Materiel Command (AMC), directed each Major Subordinate Command (MSC) to designate an NDI advocate to assist in application of NDI policy. The advocates' primary functions were to review acquisition strategies to ensure that NDI was considered and to gather NDI lessons learned.

Congress has enacted legislation to encourage the buying of commercial products. For example, the Competition in Contracting Act of 1984 provided that DoD should promote the use of commercial products and describe its requirements in terms of functions to be performed or performance required, whenever practicable.

Numerous studies and reports emphasized that the government could benefit from using commercial products and buying practices. In July 1985, President Ronald Reagan established the Blue Ribbon Commission on Defense Management to "study the issues surrounding defense management and organization, and report its findings and recommendations." In June 1986, the Commission (also known as the Packard Commission) presented to the President its Final Report, which included the following recommendation on the defense acquisition process: "Rather than relying on excessively rigid military specifications, DoD should make greater use of components, systems, and services available 'off-the-shelf.' It should develop new or custom-made items only when it has been established that those readily available are clearly inadequate to meet military requirements."

The Department of Defense Authorization Act for FY87, Section 907, "Preference for Nondevelopmental Items," responded to the Packard Commission recommendations. It required DoD to state requirements in terms of functions to be performed, performance required, and essential physical characteristics so that those requirements might be fulfilled through purchase of NDI. Besides defining NDI, it also directed the Secretary of Defense to identify and remove impediments to the acquisition of NDI and provide a report to the Armed Services Committees of the actions taken. The report, submitted in December 1987 and evaluated by GAO in February 1989, was the subject of hearings before the Senate Government Affairs Subcommittee on Oversight of Government Management in May and June 1989.

As a result of the hearings, the DoD Authorization Act for FY90 and FY91 included additional NDI legislation: Section 824, "Acquisition of Commercial and

Nondevelopmental Items." Among its numerous provisions, DoD was directed to develop a simplified uniform contract and establish an NDI training program.

Also in 1989, the Secretary of Defense issued the report of the Defense Management Review (DMR) as directed by the President. It recommended two legislative proposals: first, the Commercial Products Act of 1989, which would authorize procurements of such products under simplified competitive procedures; and second, a Commercial Acquisition Pilot Program Act, which would establish a pilot program to demonstrate the advantages of adopting a full range of commercial-style buying practices.

Finally, in November 1990, the National Defense Authorization Act for FY91 included Section 810, "Acquisition of Commercial Products," which directed DoD to adopt streamlined procedures for acquiring NDI and to conduct market research before developing contract specifications in order to determine whether there were existing nondevelopmental items that would satisfy DoD's needs. The accompanying conference report finally concluded that initial implementation of these reforms should be completed before further, new legislation is enacted. To date there has been no effective directive that specifies the ways and means to apply commercial technology and practices to military application.

DEPARTMENT OF ARMY ROLE

The Army continues to encourage NDI as a preferred acquisition strategy by updating and refining NDI acquisition policy. The 1988 version of AR 70-1 requires "maximum use of NDI." Procedures for executing NDI strategies, initially in a stand-alone handbook, are now included as a chapter in the AMC-TRADOC Materiel Acquisition Handbook, a comprehensive "cookbook" on acquisition procedures.

In September 1990, CECOM published CECOM Pamphlet 70-6, entitled *Research, Development, and Acquisition Nondevelopmental Item Acquisition Guide.* This excellent publication describes policy, procedures, and responsibilities for applying NDI to CECOM programs.

In spite of these publications, NDI opportunities are generally not acted upon in the manner envisioned by the Congress or the Packard Commission. The prevailing tendency is to follow the routine of a developmental process.

INDUSTRY ROLE

For some time, industry has cried for massive reform of DoD procurement policies and the integration of commercial and military markets. Such reform would prompt substantial savings in defense procurement and provide far quicker

fielding and improved sustainment of equipment than occurs under the standard developmental item procurement process.

As reported in a recent *Washington Technology* article, a 47-member industry group studying this subject presented in a soon-to-be-released report four principal barriers to commercial/military integration: accounting requirements and audits; military specifications and standards; technical data rights; and defense procurement regulations. This report will urge DoD to make profound changes in the regulations and laws that govern DoD procurement. It contends that separating civilian and defense applications "has perverse consequences for DoD." The results are higher costs, increased foreign reliance, lack of access to commercial state-of-the-art technologies, reduced national security, and reduced economic competitiveness.

This report comments on the aforementioned four barriers. First, it states that DoD requires separate accounting systems, harming commercial competitiveness, thus leading many firms to avoid defense business. In the second barrier, detailed specifications and standards have been used to measure reliability and performance. Consequently, today's military specifications and standards often limit DoD's access to the most advanced technologies.

Regarding the third barrier, it says that, "DoD's emphasis on unlimited data rights in technical data—including the right to distribute proprietary information to competitors—has created a major barrier to civil and military integration." To correct this, the panel recommends creating a better balance between industry's proprietary rights and DoD's data requirements and limiting the government's demands for unlimited rights.

As pertains to the fourth barrier, procurement regulations, firms that do business with DoD must comply with hundreds of federal contract clauses. The report states that "this vast and complex array of rules poses an entry barrier for small commercial businesses that cannot afford the necessary administrative and legal help. Larger commercial companies, which tend to evaluate whether the added expense of administering government contracts is worth the effort, are increasingly coming up with a negative response."

Consistently, the theme from industry calls for the Army to break down its enormous barriers to COTS/NDI acquisition, fielding, and sustainment and to apply its leadership and management interests to fundamentally changing the way it does business in order to realize the significant advantages that COTS/NDI acquisition can bring to the Army.

DEFINITIONS

A commercial off-the-shelf (COTS) item is a commercial hardware/software item that has not been modified by the government, is in the commercial inventory or production, has proven its performance in a similar environment, has an existing support structure, has an internal configuration which flows with commercial changes, and generally is integrated with other hardware/software items to become part of a system or subsystem capability.

A nondevelopmental item (NDI) is one consisting of a COTS item as well as any previously developed item that is in use by a department or agency of the United States, a state or local government, or a foreign government with which the United States has a mutual defense cooperation agreement; any item that requires only minor modification in order to meet the requirements of the procuring agency and which can be supported under the existing commercial support structure; or any item that is not yet in use or available in the marketplace but which is a modified or improved version of an item previously sold and has an existing support structure.

In short, NDI materiel may be available from various sources, requiring little or no development effort from the Army. AR 70-1 defines NDI to include "systems available from a variety of sources requiring little or no follow-on development effort to meet Army requirements."

The NDIs are typically products developed by commercial sources for sale in the private marketplace, to other U.S. Government customers, or to allied governments.

Various characteristics have been used to described NDI, such as an item that:

- Is bought "warts and all;"
- Is bought "off the shelf;"
- Is already proved in the marketplace; and/or
- Requires less time to field than a developmental product.

The basic characteristics of an NDI that have been generally accepted by the Army are (a) a variety of sources exist for production and (b) little or no development effort is needed to meet Army requirements.

These two characteristics are consistent with the definition used by Congress in the "Preference for Nondevelopmental Items" provision of the FY87 Defense Authorization Act. The provision stipulates that an NDI is (a) any item available in

the commercial marketplace, (b) any previously developed item in use by the U.S. Government or cooperating foreign governments, or (c) any item of supply needing only minor modification to meet DoD requirements. The congressional definition extends to items that are currently being produced.

Army policy treats NDI as one segment of the acquisition spectrum of products that will meet Army requirements. Full development of a new product is one extreme of the spectrum; an off-the-shelf purchase is the other.

Varying combinations of development effort and NDI lie between the extremes. The underlying philosophy is that each manager will find an optimum point on the spectrum as the "best" acquisition strategy. Three points on the spectrum are defined by the Army as distinct NDI categories. The first is off-the-shelf, or Basic NDI. Basic NDI is used in the same environment for which items were designed, and no development/modification is required, e.g., a hand gun, a computer, or a calculator.

The second category, NDI Adaptation, includes products that must be adapted for use in an environment different from that for which they were designed. Hardening, strengthening, and related modifications may be required. Such product changes may dictate testing or other verification to determine if the modifications are adequate.

The third category, NDI Integration, seeks to meet Army requirements by integrating NDI components and subsystems. Although elements of an NDI Integration are not developed by the Army, the resulting product requires R&D efforts (e.g., systems engineering, software modification, and testing) to ensure that Army needs are satisfied.

The definition of nondevelopmental items can be interpreted rather broadly. Commercial off-the-shelf equipment is nondevelopmental, but one must recognize that there may not be a commercial support base for some nondevelopmental systems. The Mobile Subscriber Equipment (MSE) system is an example of a nondevelopmental item that served only a military purpose and does not fit the commercially available or commercial off-the-shelf definition.

ASSESSMENT

GENERAL

PURPOSE

As discussed earlier in this report, the purpose of this study is to evaluate the effectiveness of the Army's acquisition, fielding, and sustainment strategy as it applies to COTS/NDI equipment. Specifically, the focus is on the electronics equipment, systems, software, and firmware procured by CECOM and ISMA, both of which have life cycle supply and maintenance support responsibility.

INTERAGENCY AND INTERCOMMAND RELATIONSHIPS

It should be noted that DoD and the military services do not have the authority to procure all electronic materiel and professional services that are the focus of this study.

The General Services Administration (GSA) has the authority vested by Congress to procure information systems equipment and services for all of the federal government, except for that which may be procured by the Department of Defense under the Warner Amendment for embedded computers in weapon systems. GSA may delegate authority for procurements to federal agencies, to include the military departments, upon request. Each military department has an Information Systems Selection and Acquisition Agency. These agencies serve as the "Central Acquisition Agency" for their department's information resource requirements. They are the interface between the department and GSA and are under continual close scrutiny by the House Government Operations Committee and GSA. The importance of having a clear understanding of the authority of GSA and these selection and acquisition agencies cannot be overemphasized. Their impact can be extremely significant where COTS/NDI information systems software, equipment, and services are to be procured. Their involvement will continue to broaden as changes are made to the Paperwork Reduction Act and the Brooks Bill.

It should also be noted that major subordinate commands of the Army Materiel Command are in the acquisition, fielding, and sustainment business for electronic systems and equipment. They might procure an identical item that is interchangeable in form, fit, and function at the card or line replaceable unit (LRU) level, but because of differences in policy and philosophy, the cards or LRUs will have different stock numbers. Only by coincidence would anyone other than the contractor involved know that the items are identical and can be interchanged for use in the field.

An example is the MLRS, fielded by MICOM or, more specifically, by the Project Manager MLRS located at Redstone Arsenal, Huntsville, AL, and the Battery Computer System fielded by CECOM and the Project Manager TACFIRE located at

Fort Monmouth, NJ. Both systems use a computer processor built by Marconi of England for Norden. Norden has a contract with CECOM and one with MICOM. The computer supplied by Marconi was a nondevelopmental item. In their respective contracts with Norden, MICOM required MIL-Quality parts, whereas CECOM did not. This begs the question: Why not the same standards?

Norden, when questioned, could not explain how it ensured that MIL-Quality parts were used by Marconi. Norden suggested that "cherry picking," meaning some means of manual selection of parts, might be used. Both commands had Level III drawings and provisioning documentation requirements. As a result of this process, different national stock numbers were assigned to the LRUs. The supply system had no way of knowing that the LRUs were interchangeable in the same manner that a Fram filter and a Purolator filter would be for an automobile.

INTEROPERABILITY

The above example is used to emphasize that the problem of acquisition and life cycle support of COTS/NDI equipment is not solely an Army or CECOM problem. It is a much broader problem. It can be considered a national security issue of affordability, as well as one of supportability of those items worldwide or wherever any element of the U.S. Armed Forces may be deployed to use them. This dictates interoperability for command and control and for common logistics supportability. Effective command and control cannot be achieved when there is a lack of interoperability because there are no common standards and protocols within the U.S. Army and between the U.S. Army and other elements of the U.S. Armed Forces.

European Allies and Third World countries are moving swiftly to International Standards for Open Systems Architecture for information systems. The Office of Management and Budget (OMB) has directed that all federal agencies, to include DoD, migrate to POSIX and GOSIP as the U.S. slowly moves to the open systems environment and Open Systems Interconnect (OSI) standards. This thrust, if no other existed, would indicate that CECOM should join with the U.S. Army Information Systems Command (USAISC), the Defense Information Systems Agency (DISA), and the other military departments and federal agencies in transitioning Army tactical command and control systems and management information systems to OSI standards at all levels, to include International Standards Organization (ISO) standards for communications. This will greatly facilitate future use and exploitation of COTS/NDI equipment and technology for Army use. The Army and the other Services will be able to ride the technology coattails of the information systems (electronics) industry and exploit the latest technology, rather than become bogged down with obsolete technology using expensive "militarized" equipment.

The issue of common equipment or maximum commonality of equipment across all the Services reduces the supply and maintenance support problems with which the Joint Commander must be concerned. Interservice supply and maintenance support is something that must be planned and clearly understood. The lack of interservice support for common items between the Army and the Air Force was evident in earlier conflicts, resulting in inadequate support to commanders of both Services in the field.

REQUIREMENTS ORIENTATION

The requirements definition process is the initial and most crucial step in determining what is necessary. It is during this process that the capabilities that are needed are defined. Operational considerations to include size, weight, power, and environmental limitations are outlined. Doctrine issues are also reflected during the requirements process.

Generally, the Army is driven by the thrust to make every item of equipment survive in any environmental condition with little or no care by the operators/users. The blame spans from Congress, OSD, GAO, and across the entire Army, to include those who write and validate user requirements. Commercial equipment generally will not meet the high and low temperature requirements that are established in requirements documents and technical specifications. When challenged by the Army senior leadership as to why these extreme environmental specifications are sustained, when to do so incurs an enormous cost and great delay in fielding, the lower level decision makers in both the U.S. Army Training and Doctrine Command (TRADOC) and AMC seem to be totally unable or unwilling to reduce their requirements/specifications. The reasons span the gap from blind adherence to an unreasonable requirement in the first place, through an inability to make a reasoned decision, to a reluctance to change for fear of losing the authority—indeed, the position—one has within the multilayered development community. CECOM is as guilty as any in this regard.

Even when COTS/NDI is specified as the objective in the TRADOC requirements document, it is driven to a major degree of "militarization" by the AMC subordinate commands that write the technical specifications for the PEOs/PM, by TRADOC combat developers, and by the Test and Evaluation community. It is very difficult to buy commercial products with no major modifications, except for administrative vehicles and communications and electronics items procured for USAISC. USAISC prepares its own technical specifications, often as directed by DISA. Even then, the AMC supporting commands may often attempt to force the procurement of an expensive but useless logistics support package, unless senior management becomes involved. This may be a reflection both of a lack of command interest in the process and of what senior

managers think of their responsibilities to determine the most efficient and effective support concept.

LOGISTICS SUPPORT

In spite of the above criticisms, CECOM has been forced to become creative and develop system-unique supply and maintenance procedures for COTS/NDI systems and equipment. As an exception, it did so for the Integrated Wideband Communications System in Southeast Asia. An aggressive Project Manager with the support of technically competent General Officers (masters degrees and PhDs in EE and physics) with field experience and experience in the R&D and training arena strongly encouraged CECOM to tailor the supply and maintenance support for that system. That action and the contractor-operated Area Maintenance and Supply Facility Concept revolutionized support for USAISC systems and equipment worldwide. Those facilities are contractor operated worldwide today by USAISC, as they were in Southeast Asia.

TACCS is another example of what can be done with an aggressive, technically competent Project Manager and General Officer support. Both the Project Manager and a General Officer were parties to the Integrated Wideband Communications System (IWCS) effort in Southeast Asia. There was strong opposition to contractor support of TACCS by the TRADOC Logistics Center, but it did not prevail.

MSE is another positive example, and again contractor support for life was directed by the Under Secretary of the Army and supported by the Vice Chief of Staff. Without that high-level direction, MSE would still be ill-defined, floundering with cost overruns, and awaiting the logistic support structure prior to fielding. It should be noted that the MSE technology that was initially fielded is being improved and expanded through the VECP and ECP process. A contractor-conducted modification program keeps pace with these modifications for all fielded MSE equipment and with the additional training required by the units having this modified equipment.

CECOM's experience clearly reflects that it can do what it is forced to do, as in the case with MSE. Earlier with DAS-3, it encouraged military maintenance and spare parts provisioning to support the system. TRADOC and the Project Manager supported the CECOM approach to the DAS-3 as they had no other experience base to draw upon.

Different life cycle support techniques are required for a system such as MSE than would be required for systems such as TACCS, in which the LRUs of the COTS equipment are "identical" to those used in commercial systems.

One could question why Common Hardware/Software (CHS) computers are classified as following an NDI strategy rather than a COTS strategy. TACCS and CHS are both ruggedized commercial off-the-shelf items. Their acquisition strategy was essentially the same. The only difference is that TACCS was procured by the Information Systems Selection and Acquisition Agency, and CHS was procured by CECOM. CECOM is the life cycle support agent for both.

Another example of success is the U.S. Army Europe Tactical Command and Control System (UTACCS). Commercial off-the-shelf equipment was exploited fully, and modern technology was brought immediately to the operational commander. It provided a capability in months that the Tactical Operations System (TOS) and the Maneuver Control System (MCS) had taken years to try to deliver via the conventional process and modifications of that aged process. Packet switching was fielded in the UTACCS program. This was done because it was clear that MSE was coming, and that, without packet switching, a C^3 system such as UTACCS would be a failure. UTACCS was not a high-visibility program in TRADOC, OSD, or Congress. It was high visibility at the colonel level and higher in the Theater and at USAISC, to include USAISMA. CINCUSAREUR had it as a top priority and personal interest item for General Glenn Otis and his successor General "Butch" Saint. They worked with USAISC and ISMA to make it happen.

Another successful example is the multiservice small computer program. The Army purchased more than 120,000 of these commercial off-the-shelf Zenith Z-248 personal desktop computers under the Desktop II contract. They are used in garrison and field applications worldwide. They were used in Operation DESERT SHIELD/STORM applications. Contrary to the expectations of some who predicted doom, this equipment performed superbly in that environment with user preventive maintenance. It was procured at less than one-fourth of the price of a militarized product or less than one-third the price of an NDI device such as TACCS, which was "ruggedized and adapted" for military use. The small desktop computer programs will go down in history as some of the wisest and most economical commercial off-the-shelf electronic equipment procurements in DoD. The TRADOC schools and Service testing agencies played almost no role in the requirements definition process for these items. Desktop I and II were contracts with Zenith. Desktop III is with UNISYS. These procurements were contracts awarded not by the Army but by the USAF, with USAISC representing the Army user and USAISMA as the Army PM. These examples point up the fact that the tradeoff of requirements can and does happen when the "real user" and the PEO/PM community have the opportunity to bypass the "conventional" acquisition process, to include the TRADOC schools and the DT/OT community. Rather than being bypassed, the TRADOC Schools should do all they can to facilitate the "real users" interest in this regard.

LEVEL OF EXPERIENCE

The Army has found that when senior officers (general officers) become involved in the review and determination of the supply and maintenance support concept for all high volume or major items of equipment or systems, a rational approach is reached. Common sense and business sense then seems to prevail rather than following regulations in a lockstep fashion. The MSE, TACCS, UTACCS, and small desktop personal computer contracts (Desktop I, II, and III) model could easily become the rule rather than the exception for logistic support, if the Army leadership so dictates. This would result in less cost to the Army and enable the Army to depend on the commercial market base for product support. Form, Fit, and Function is a solid concept used during World War II that could be used today in either military or contractor logistic support. Level III drawings and detailed documentation should become the exception. Today it seems to be the rule, with exceptions for a limited few. Until NDI regulations are written to portray a totally new approach to doing business with industry, only a few senior officials have the wherewithal to direct a change to the form, fit, and function concept or to a concept encompassing contractor logistics support. It would seem that the Army, TRADOC, and CECOM in particular, could adapt to the sensibility of minimizing the modifications of proven commercial products and of getting the materiel items to the field as promptly as possible. This should be a matter of course, not by exception, when mandated by Army senior leadership.

LIFE CYCLE SUPPORT

It is evident that the logisticians at CECOM have reviewed and studied the NDI/COTS issue. Apparently because of their paradigms, the results continue to come out the same, namely, that the "standard" way of doing business should not change. Information received from that community leads to the conclusion that the only way to go is to buy maintenance and provisioning data and train Army military and civilians for maintenance support. A presentation to the study team by USAISMA was an exception.

What this bears out is that the acquisition, fielding, and sustainment of COTS/NDI remains a serious problem for the U.S. Army. A major change in culture is necessary, and that cannot happen quickly. The current methods, procedures, and cults have been grown, cultivated and taught since the end of World War II.

One of the most complex issues is how to ensure life cycle support for COTS/NDI items when in most cases the life cycle is undetermined. The equipment and/or systems procured and used by the U.S. Army are not replaced or upgraded as frequently as is done with the same items in the commercial sector. Electronics equipment, such as computers, is in a constant state of evolution as

electronics technology rolls into a new or more advanced era every 18 to 24 months. This evolution continues to reduce the cost of computers and other high-volume home electronics hardware products available on the commercial market. The impact on computer software is almost insignificant or minimal, as industry generally tries to protect its customer base by ensuring plug or backwards compatibility of hardware and software.

In spite of the reduction in hardware cost, it will never be economically practicable or feasible for the U.S. Army to remain technologically current by replacing its electronics equipment such as computers every three to five years. The Army inventory is too large, and the cost of replacing that entire inventory en masse is therefore too great. It is not unusual for the U.S. Army and other federal government agencies to have equipment in use for periods of 15 to 20 years or more. This is true even for items such as typewriters and other office machines. That same trend is continuing in the Army, even for low-cost electronics items such as personal computers, small multiuser computers, and work stations. Therefore, under these circumstances, the most efficient support arrangements would be to require contractor support, to include technology insertion when appropriate.

Life cycle support, worldwide, is very important to the Army, as the Army can be required to deploy to any location in the world on short (hours') notice. It must be able to keep its equipment and systems operational so as to ensure successful mission accomplishment. The failure or loss of an item of equipment on a critical task could make a difference between mission success or failure. In full recognition of this fact, it is easy to comprehend the emphasis placed on life cycle support. It is also easy to understand why military personnel and civil servants resist change in the methods of getting or planning for life cycle support. Very few people are willing to take a chance to specify COTS/NDI items and contractor support because of the fear that the two will not meet military performance and support requirements.

Many in CECOM are convinced that there is only one way to do the job of "provisioning," and that is the way it has always been done, with few exceptions. That "right" and "only one way," in their view, to ensure life cycle support is to buy drawings (Level III) and documentation to the piece part level on LRUs. This practice is supposed to ensure a build-to-print capability where additional components, end items, assemblies, or repair/replacement parts can be procured competitively, resulting in the lowest cost reprocurement of hardware "identical" to the original design. The notion to follow this practice in order to emphasize competition and the expectation of a low bid frequently results in poor quality or noncompliance and a loss in program efficiency. It also results in depots/warehouses being loaded with repair/replacement parts that are never used or rarely used. This is an unnecessary expense to the government.

Existing Army Regulations, such as AR710-1, AR710-2, AR700-18, AR700-55, AR700-127, AR700-138, AR700-142 and associated pamphlets are geared to that one way of provisioning. To provision in any other fashion is an exception to the rule. Exceptions to the rule are frowned on. Justification and defense of deviations from the norm are required, and the proponent of deviations must face many questions from senior traditionalists who want to defend the "business as usual" approach for provisioning and logistics support of "all" equipment. The "all" includes conventionally developed equipment for military use that undergoes a 12- to 20-year acquisition cycle (full RDT&E and production for initial deployment), such as a SINCGARS radio, which usually ends up being fielded with obsolete technology because of the long development and test cycle. The "all" does not differentiate between a commercial off-the-shelf item and the conventionally developed items. The "all" does not differentiate between the conventionally developed items and nondevelopmental items. There is one mindset. Total, full support via the "normal" military logistic system, including depot-level maintenance and repair, is the mindset that prevails. A total paradigm shift is required to change the mindset of the CECOM logisticians who want to pursue full support in virtually all cases.

CHANGING THE MINDSET

How can the Army change the "norm" or the mindset? The first order of business is to create the environment for change by adding emphasis to and enforcing the regulations to "require" the use of the existing commercial support system and pipeline for life cycle support of COTS items of equipment. The definition of COTS items must become standard and common knowledge to persons of authority as well as to laymen in the operations, logistics, engineering, and acquisition communities. Economics, or what makes good business sense, must become an issue of concern to everyone in the Army. Honest cost comparisons, as well as technical performance, timeliness, and availability must be considered, and realistic tradeoffs must be made. This applies to end-item acquisition as well as to methods of support to be used. Customizing support concepts for "all" equipment must become the standard way of doing business. It must become the norm. Indeed, because industry has so frequently criticized the Army for failing to apply COTS/NDI techniques in acquisition, fielding, and sustainment, consideration should be given to publishing a completely separate Army regulation for COTS/NDI that can be the explicit "cookbook solution." Then the administrative mechanisms (people) throughout the materiel development system will be "forced" to comply with a totally different culture of regulatory instructions.

To help change the mindset, the service schools, to include the Defense Systems Management College (DSMC), must teach their students that "business decisions" in the acquisition of materiel must include the full spectrum of alternatives and always consider use of commercial equipment and technology for military applications. Business decisions must include technology evolution, cost of

acquisition, timeliness, life span, and logistic support. The students must understand that "total in-house support" may not be the most effective or efficient method of sustainment for high technology items or in areas where commercial technology leads military applications, e.g., information systems.

There is no doubt that strong advocates are necessary to push COTS/NDI utilization. The Army must have a stronger base of technical and business competence in its Acquisition Corps. The education of officers and civilians in science, engineering, and business at the advanced degree level cannot be overemphasized if the Army is going to change the culture of those who work in its acquisition and developmental processes. The Army needs officers of all branches who are able to understand existing and emerging technologies, as well as those who are skilled in battle management or fighting the forces. Technologists without this latter capability are virtually useless to a modern Army. Hopefully, the Army may see more competent contracting personnel and program managers as a direct result of the Acquisition Corps, for it is these personnel who are so critical in the determination of how programs should be constructed and supported. Moreover, unless the Army places some of these Acquisition Corps members into combat development positions in the TRADOC service schools, they will have little influence in requirements generation. They will contribute little to the understanding and translation of operational needs into better statements of requirements and making the necessary tradeoffs for COTS/NDI. In short, a more broadly based officer or senior civilian is liable to be more adaptable to change and to see how certain alternatives, such as COTS/NDI, make good business sense.

REQUIREMENTS

REQUIREMENTS GENERATION

Requirements for C³ COTS/NDI are generated in the same way they are for developmental items. The combat developer, often referred to as the user or user's representative, and hereafter specifically referred to as the Signal School, identifies a projected Army deficiency that cannot be solved through a change in doctrine, tactics, training, or organization, or by improving or modifying an existing Army system. Thus, when a materiel solution is required, the Signal School, with support from CECOM, documents the need in an Operational and Organization (O&O) Plan. The approved O&O Plan formalizes the requirement to conduct a market investigation to determine the availability of commercial, other Service, or Allied nation equipment that may potentially resolve the battlefield deficiency. If the capability exists to satisfy the materiel need from one of these sources, Army policy requires that a COTS/NDI acquisition alternative be recommended by CECOM.

Various analyses, cumulatively termed the Concept Formulation Process (CFP), are conducted to identify available options and to analyze their costs and benefits. Existing equipment is analyzed and compared to the requirements stated in the requirements documents. Tradeoffs in cost, schedule, and performance are identified and analyzed. Requirements may be adjusted by the Signal School to permit the use of an NDI solution even though it may not fully meet the need as originally written. One way to do this is to separate essential requirements from those that are optional and those that can be inserted later as modifications. Typically, this can be reflected in the P³I section of the solicitation for later application. This is because many times an imperfect materiel solution acquired quickly is preferable to an optimal one taking many years to develop.

Information from the CFP and revised O&O Plan is used to develop the Required Operational Capability (ROC). The ROC is a formal requirement that, when approved and funded, commits the Army to program development or acquisition. An approved ROC is the basis for the decision to start full-scale development or acquisition of a materiel system.

REQUIREMENTS STATEMENT

Possibly the most critical aspect of the life cycle model in terms of its effect on the rest of the cycle is the statement by the Signal School of the requirement. Whether it is a developmental or a COTS/NDI system, the Signal School states its requirements in both a generic sense and in an operational context. Failure to do so will deny opportunities for the realization of more than one possible solution to the problem being addressed. All too often, the Signal School writes a requirement statement with too fine an eye on system specifications. That is not its

responsibility. It must have faith that the developer (CECOM) will find a solution to the mission need without having to describe it in infinite detail. The combat developers at the School have an obligation to ensure the portrayal of broad parameters within which industry can then offer alternative solutions with one or more technologies to meet the stated need.

The Signal School has an option in the pursuit of a requirement. It can define a requirement in terms of *essential* features, which are mandated, and *desirable* features, which are not. This precludes the so-called "bells and whistles" from being inserted and permits greater flexibility for industry to respond to an operational need expressed through a broad functional requirement. Maintaining an eye on essentiality avoids what is commonly known as the "creeping requirement," namely, an attempt by the Signal School to add one more performance parameter—or even worse, one more level of detail—usually without full justification, which then creates an increase in cost and a considerable delay in development. Ideally, the Signal School should state a requirement, hold to it unless tradeoffs are required, and then wait until the item is developed before adding to the requirement or taking advantage of a new technological approach. The latter can be inserted later as a pre-planned product improvement, thus ensuring that the system proceeds expeditiously toward fielding.

Frequently, the Signal School states the requirement in considerable detail for fear of being cut out of the dialogue before the final detailed description of the need is written into CECOM's solicitation. That, in itself, is not proper justification to change the system. Rather, two things should occur in order to ensure that the process functions properly. First, the Signal School should state its requirements in generic terms, without detailed descriptions. Second, the School should be continually aware of what is taking place in a program through the information and coordination loop managed by CECOM or the appropriate PEO/PM. Today, the dialogue between the user and the developer—between the Signal School and PEO/PM and CECOM—is not what it should be.

REQUIREMENTS CONFIGURATION MANAGEMENT

The Signal School should maintain a consistent approach in the development of its requirements, always recognizing that COTS/NDI solutions might be the most viable and economical alternatives, especially in the support area. In fact the Signal School could be ~~be~~ a veritable champion of COTS/NDI opportunities if it wanted to, overcoming what appears to be a reluctance on the part of CECOM to take a risk and try a new approach. By carefully working COTS/NDI issues out with the PEO/PM and CECOM early in the acquisition process, the chances for success in a program are markedly improved. As stated above, by writing requirements broadly enough to accommodate available products or solutions, the Signal School enhances the COTS/NDI process. Moreover, if its

combat developers pursue performance requirements in a generic sense and reliability requirements in broad terms, these actions will serve to permit the material developers to solicit industry to respond as it is capable of doing. For the Signal School and the PEO/PM and CECOM to become too specific defeats the purpose of COTS/NDI. It is feared that this single factor of excessive detail denies the PEO/PM and CECOM—and the Army—good opportunities for meeting the needs of the user in the field in a most timely manner.

The acquisition strategy for COTS/NDI should permit the development of realistic requirements based on operational needs expressed by the Signal School on behalf of the real user in the field. Requirements should also be compatible with the technical realities of the marketplace. The acquisition strategy for COTS/NDI should provide for some type of control of requirements by the combat developer throughout the development process, including the ability to adjust requirements to technical realities at the right time in the process. In particular, the Signal School should exercise much stronger management of the requirements throughout the life cycle of a COTS/NDI system. At the onset, it should institute a requirements configuration management process. Recommended changes to the baseline would be controlled and made based on cost, schedule, and support reasons. Technology insertions by the contractor would be a natural evolution through the requirements configuration management process. The Signal School should conduct periodic reassessments of a requirement based on threat changes, the operational concept, available technology, and cost. In a COTS/NDI program, more so than in a developmental program, a change to the requirement that does not incur a penalty in cost and lost delivery time could be inserted. This should be exercised on a case-by-case basis, and decisions that are prudent should be made between the user, the developer, and the contractor. These critical issues and decisions should be escalated to the General Officer, SES, and Corporate Executive levels for quick and joint resolutions.

USER-DEVELOPER DIALOGUE

The dialogue between the user and the developer ensures that the user's requirement is being properly satisfied with an accurate description in the solicitation. It also enables the developer, and later the contractor, to have immediate access to the user's thinking about his requirement, its continuing validity, its interpretation for design engineers, and its possible modification by the developer or the contractor when to do so makes operational and fiscal good sense. Too often the Signal School is left out of an acquisition strategy forum discussing the rationale for some feature of the requirement. The absence of this dialogue with the user can cause severe problems in a program's life cycle and/or success. A bond between the PEO/PM network and the applicable TSM at the Signal School is essential for the success of any program. For example, early involvement of the Signal School in software development is crucial. The School must provide

operator and maintenance training; hence, it must have the benefit of both PEO/CECOM and contractor views and decisions on software engineering and software support planning. Operational doctrine is embedded in software, and that doctrine emanates from the Signal School or the Defense Information Systems Agency for most items.

The Signal School attempts to write very short ROCs, that is, two to three pages in length. Under these circumstances, it is essential that the School and CECOM be in frequent face-to-face contact. There is much about a system's performance that cannot be described in three pages—hence the absolute need for constant dialogue between the two parties. Periodic in-fighting between the user and the developer has occurred in the past. A PM's concern that a slipped schedule or loss of funds, due to the user's change in the requirement, will cause a slip in schedule or overexpenditure or loss of funds is real. This has resulted in the "relief for cause" of PM's in the past. The responsibility for delays and cost overruns are borne by the PM. There is no sharing of that responsibility.

The PM must therefore represent the developer and the user equally. The PM must have access to senior management in both communities to preclude program problems. Any system that fails to have constant dialogue with the PM, materiel developer, Signal School, and contractor is subject to failure. The Signal School's ability to identify issues early on, to know the basis for the system's need and performance, and to be a spokesman for the system can be turned to distinct advantages in the life of a program. The "user-developer-contractor" dialogue is essential for complete system success.

Much emphasis is placed by everyone on user participation in the materiel acquisition process. It is extremely important that the "real users" in the field participate in the requirements generation process. Users from the major commands who will receive the products/items should even participate in some manner in the requirements definition, development and testing processes. The Signal School, as the user's representative, may not always adequately represent the total Army user community to the degree that is necessary to fully exploit the advantages and opportunities that exist in COTS/NDI applications. When all parties are fully aware of the program processes and progress, however, they become a part of it and will do a better job of ensuring real user acceptance.

There have been occasions when the real user in the field, on seeing a COTS item, immediately wants that commercial capability to meet an operational need. This is the point at which the Signal School, as the real user's rep, must display a balanced view as the "proponent" for the real user's need. The school can take one of three approaches. First, it can support the user's demand without regard for the feasibility of procuring the system and its associated support package. Second, it can reject the user's request, because it is well out of the mainstream of the process to

buy off the shelf, preferring instead to follow a more traditional approach to developing a system, thus taking more time and funding than would otherwise be the case. Third, it can take a balanced approach and pursue with CECOM a COTS/NDI approach with a modification to satisfy both the real user's needs and the developer's concerns regarding the supportability of the system. When proceeding along any one of these avenues, the Signal School should consult with the applicable PEO/PM and directorate in CECOM that will be responsible for the acquisition, fielding, and sustainment of the system. In short, the PEO/PM and CECOM need to be brought in early on during the concept exploration phase by the Signal School. This permits an essential dialogue on how an acquisition plan can best be formulated.

MARKET INVESTIGATIONS

The Signal School's role in market investigations could be improved. Such investigations are conducted by the PEO/PM and CECOM, but often without the combat developer's knowledge or involvement. The sooner the School is brought into a market investigation, the quicker a requirements document will be prepared and a program realized. Since the School has the say-so on generating the requirements document, it seems patently evident that its combat developers would be a lot smarter in developing that document if they were consistently brought in on market investigations and its results. All too often the Signal School's Combat Developments Directorate is not adequately resourced to participate in this important early phase of a program's life cycle.

FIELDING AND SUSTAINMENT

The Signal School and the Combined Arms Support Command (CASCOM), previously known as the Logistics Center, have a shared responsibility with the PEO/PM and CECOM for the fielding and sustainment of a COTS/NDI system. All too frequently, they are left out in early formulations of alternatives for fielding and support. Decisions regarding the level of maintenance support and whether it should be contracted, totally or in part, have an impact on the real user in the field. Close coordination at the very beginning of the development of the acquisition plan between the PEO/PM, Signal School, CASCOM, and CECOM are critical to subsequent development of the RFP and the best possible method of support. Many problems in COTS/NDI supportability could be eliminated if the CASCOM and Signal School were brought into the decision process at the very beginning and made to feel that they are sharing the responsibility with the PEO/PM and CECOM for fielding and supportability. It is evident that inadequate manning within the Signal School's Combat Developments Directorate adversely impacts on the School's ability to play its proper and full combat developer's role.

COMBAT DEVELOPER EXPERIENCE

Unfortunately, in many cases the level of TRADOC (Signal School) and CASCOM combat developer experience is low. Often, captains act as action officers in combat developments. It is seldom that field grade officers participate in the initial requirements definition process. TRADOC combat development directorates are generally not staffed with front-running field grade officers with the broad operational and technical background to understand the high technologies that will ensure that the Army leverages technology optimally. As a consequence, the engineers and scientists in the AMC development commands who know very little about real-world operational requirements find themselves, often by default, in the position of driving the requirements definition process. When this happens, it is rare that these AMC individuals apply simple COTS/NDI solutions in the requirements formulation process. At CECOM and the Signal School, this situation works against the commercialization process.

The combat developers from the Signal School have frequently been criticized for overstating a requirement. Often this has been due to an inability to recognize the cost of a 100% solution to a deficiency as compared to an 85% solution. Combat developers have a shared responsibility for the prompt fielding of equipment, especially COTS/NDI systems. Hence, they should be sufficiently experienced, of an adequate rank, and properly trained to be confident about making a determination on the adequacy of an NDI item if it meets, for example, only 85% of the requirement. The Signal School leadership must say "no" to nonessential requirements. Knowing when and how to do this comes from experience, experience that TRADOC combat developers have traditionally lacked when compared to the materiel developers in AMC.

TRADEOFF DETERMINATION

While the Signal School has the responsibility for prioritizing a system, program, or even a technology, it must also be prepared to undertake tradeoffs. Facing up to this reality, the combat developer must be conscious of costs and help provide cost realism to the equation of the development cycle. He must know how to cut back or adjust his capabilities when faced with costs that could be considered unrealistic. He must also focus on the cost of ownership, that is, knowing the O&S cost for the system for up to 5, 10, or 20 years. Supportability is always a factor for tradeoff considerations. For example, the Signal School's combat developer could easily be faced with the reality that organic support at all levels is simply uneconomical.

DEPARTMENTAL RESPONSIBILITIES

In the world of Army C^4, there appear to be two "players" representing user interests at the departmental level. One is in ODCSOPS-FD, in the form of the C^2/Signal Division, and the other is in the Secretariat, namely, the Tactical Systems Division in DISC4. These two agencies are recognized by some as involved in frequent in-fighting, whether in regard to the requirement, program priority, or funding. This overlapping of functions and responsibilities between ODCSOPS-FD and DISC4 is not helpful and should be resolved. It is recognized that this contested area is not new and traces its origins well back to the days of ACSFOR and ACSC-E. Nevertheless, it makes no sense to have internal conflicts in C^4 matters that impede the process. Consideration should be given to ensuring that DCSOPS selects the system concepts; defines the operational interfaces between the Army, other Service, theater systems and functional relationships; sets priorities; and proposes program and budget tradeoffs. DISC4 should be the coordinator and advisor, making certain that Army battlefield systems are integrated into the strategic and other operating systems. In reality, DISC4 must oversee all Army C^4 responsibilities to include those functions performed by the Army Staff and Agencies.

HARDWARE ENGINEERING

GENERAL

The premise behind COTS/NDI acquisitions is that the use of commercial products, proven in a nondefense environment, for military application makes good sense. To conserve R&D funds and field relatively reasonable facsimiles of the user's requirement in an expeditious manner mandates the use of COTS/NDI wherever possible. In the area of the hardware engineering (or system performance) this logic seems to be defied over and over. All too frequently, materiel developers want to follow the conventional acquisition process, thus preventing the realization of all the benefits of COTS/NDI. This section treats this subject area and makes certain observations on how the government could improve, indeed, fix the process.

PRODUCTIVE COTS/NDI PRACTICES

The PEO/PM and CECOM should prepare specifications that describe operational and functional requirements at the system level. This will allow industry the necessary freedom to meet the overall system requirements both operationally and environmentally. It is important to state the operational and functional requirements for the correct usage of the equipment. For example, if the equipment is going to be used in all Army vehicles, wheeled vehicles only should not be specified. The converse of this example is also true.

Emphasis should continue on differentiating between COTS/NDI and developmental acquisitions. The logisticians at CECOM should recognize that significant differences exist in the Contract Data Requirements List (CDRL) for COTS/NDI. Additionally, for systems that require Army Standard "Type Classification," different guidelines should be developed that will allow this task to be accomplished in a shorter period of time.

COTS/NDI equipment and software packages should be used as supporting platforms for special applications. These applications are significant in the areas of workstations and electromechanical interfaces. Where applicable, commercial and international standards should be used, provided interoperability requirements are met. This allows the use of standard products available in the commercial marketplace without modification to meet a MILSPEC.

CECOM should specify and use commercial documentation to support the user's maintenance requirements. In most cases, the commercial vendor's documentation requirements are the same as the military requirements. If the documentation falls short of the Army's needs, the document should be augmented with a supplemental manual.

COUNTERPRODUCTIVE COTS/NDI PRACTICES

It is perceived that the PEO/PM and CECOM employ "boilerplate" RFPs that impose excessive requirements, rather than using RFPs that have tasks and specifications tailored to a particular program. Some additional planning and review on the front end will pay significant dividends, with the Army/DoD dollar going farther and programs being accomplished sooner. Likewise, MILSPECs and development specifications should not be mandated in COTS/NDI procurements. This means selecting only the pertinent paragraphs that apply to ensure that the system meets the operational and functional requirements. The Army should not automatically require the contractor to adhere to a specification (e.g., MIL-STD-454) that, especially for COTS/NDI, contributes to unnecessary processes and thus is not beneficial to the Army.

Occasionally, outdated specifications are invoked. For example, a recent procurement called out MIL-STD-462, Notice 3, that required testing using manually operated EMI meters, rather than allowing the use of automated spectrum analyzers.

The environmental specifications represent an area that will drive the selection of components. If the requirements specify environmental conditions within the usual range of available equipment, the selection could be COTS/NDI. If the conditions are to be more stringent, then additional costs may be encountered in the packaging of COTS/NDI equipment, and in extreme cases the selection of militarized or special equipment may be necessary. Examples abound where both the combat and materiel developers have insisted on extreme specifications whose necessity was questionable and whose cost was excessive.

The Steering Committee on Security and Technology, created by Washington's Center for Strategic and International Studies, reports that the Defense Science Board found electronic products made to MILSPEC are 8-15 times more costly and far less reliable than commercial counterparts. And yet, this fact does not seem to impact on the mindset of engineers who constantly insist on applying MILSPECs to COTS/NDI products.

The PEO's/PM's and CECOM should stop the bureaucratic review and processing of change requests submitted by contractors. A mechanism should be established whereby speedy approval of changes/improvements to the system can be made without forcing the contractor to assume unreasonable risks. The existing review process in itself is detrimental to any reasonable degree of efficient program management and certainly contradicts good TQM practices.

CECOM should focus on the key issues of COTS/NDI contract management and technical control and avoid unnecessary involvement with internal contractor documentation. For example, a series of MSE Interface Control Drawings (ICD) had been baselined by the government customer. When GTE had to make some design changes to meet performance criteria, the government insisted on formal (and expensive) Engineering Change Proposals (ECP), followed by a lengthy exchange of questions and answers. It would have been far more prudent for the government to concern itself with the upper level specifications than to become embroiled in GTE's design control procedures.

NEW COTS/NDI INITIATIVES

The PEO's/PM's and CECOM should be more open to creative solutions to problems posed by contractors. There should also be more problem solving opportunities, like the VECP program, that give the contractor some incentive to find cheaper and faster ways of doing things. There should be more open communication between the Army and the contractor so that the latter can understand the operational problems encountered by the users, and then work with them to solve these problems. This should first happen at the working level and be quickly raised to upper management on both sides when such issues cannot be routinely resolved.

Data submitted under CDRLs is frequently reviewed by CECOM support contract personnel who request incorporation of their comments (recommended changes). After the comments are incorporated and the document resubmitted, additional comments from a different reviewer, which often conflict with prior comments, are generated. This results in successive review cycles and prolonged delivery schedules. The CDRL review process should have a focal point to screen government comments for reasonableness and consistency.

There is a trend developing in Firm Fixed Price/COTS/NDI-type contracts to include significant optional quantities over a span of three to five fiscal years. In some instances, only the initial fiscal year is obligatory on the part of the government. Experience has demonstrated extreme variance between solicited quantities and those planned for the POM funding cycles. There should be consistency between the contract and the POM funding cycles.

In many instances, Functional Purchase Descriptions (FPD) are unclear and/or incomplete. This results in ambiguous specifications that are often misunderstood.

One way that COTS/NDI could be greatly enhanced would be the adoption of standards in system requirements. The Army and DoD are committed to open system interconnect standards at all levels. More and more hardware and software

vendors are developing their products around industry standards with migration paths to emerging industry, international, and government standards. The basic standards being specified today are as follows:

Operating System	POSIX
Windowing	X-Windows
Data Base Query	SQL
Data Element Standardization	JINTACCS, JCS PUB 6-04.4
Graphic Processing	PHIGS with transition to PEX
Communications	TCP/IP with transition to GOSIP
Programming Languages	C and Ada

It is expected that the Defense Information Systems Agency will drive all the Services and DoD Agencies to OSI and common standards as that Agency matures.

Technical documentation, especially operators' manuals and maintenance manuals, is a basic requirement in every system acquisition. Systems that are completely COTS/NDI or contain COTS/NDI equipment should permit the use of COTS/NDI technical documentation instead of calling for military technical manuals. Since both the military users and the maintenance personnel as consumers use COTS/NDI documentation at home when dealing with their own equipment, such documentation should serve the same purpose when in the field.

Perhaps the user should get more involved in these choices and not leave this matter solely to the discretion of CECOM. The cost and time involved in developing, distributing, and updating formal technical manuals is ever increasing. The use of COTS/NDI documentation would reduce the fielding time costs associated with the development and maintenance of such documentation.

SOFTWARE ENGINEERING

B' ~KGROUND

Developing application software based on COTS/NDI software packages has both positive and negative implications. COTS/NDI software is used for the following basic reasons:

- COTS/NDI software packages provide ready made system building blocks of features, capabilities, or data processing services. These building blocks may be of a general nature, such as the computer processor's operating system, Windowing and Display Systems (e.g., X-Windows), Data Base Management Systems, or Screen Editors. A specialized building block could be a digital mapping system.

- COTS/NDI software packages reduce development costs and development risks.

Legal considerations associated with the COTS/NDI software engineering approach are reflected as follows:

- Typically, COTS/NDI software packages are acquired from outside vendors through license arrangements and warranty provisions that flow with the delivered system application.

- The use of these packages limits the rights of the application supplier and the government in the delivery and distribution of the COTS/NDI software packages.

- The pass-through implications contained in the licensing, warranty, rights, and restrictions to rights are typically not addressed early on by the designers, nor by the government acquisition managers.

Acquisition considerations include the following:

- The procurement agency buys new development systems described by technical specifications and Statement of Work tasking documents. The documents may encourage the use of COTS/NDI software packages, but typically are silent to how the COTS/NDI software is to be controlled.

- The contract specification and lower specifications typically fail to identify these packages as a separate Computer Software Configuration Item(s) (CSCI).

Considerations for specifications/design include:

- Responsibility for system performance becomes ambiguous with the undefined use of COTS/NDI software packages:

  - Applicability of system performance requirements to COTS/NDI software packages can be difficult to establish.

  - Design responsibility for total system performance can become an issue, with application designers taking responsibility only for their new work, ignoring the implications of the COTS/NDI software packages in the system.

  - Performance problems have been solved by changes to the COTS/NDI, thus invalidating the software packages as COTS/NDI.

- COTS/NDI software packages should be accepted only with the assurance that all specification requirements will be met without modification to the software package. As a result, performance requirements could continue to flow with the application specification.

There is a lack of software structure visibility, for example:

- COTS/NDI packages become buried in the delivered system, making field updates impossible without involving the application supplier.

- Embedded COTS/NDI packages are not visible and, therefore, support organizations cannot plan for appropriate maintenance and logistics.

There are significant differences between commercial and military applications. These include:

- Security—Certain features of COTS/NDI software packages may not comply with existing security requirements. Not recognizing these differences from the start can lead to design and contract conflicts.

- Integration With Application Software—The task of integrating COTS/NDI software packages from multiple vendors can create serious application design problems. Many COTS/NDI software packages are designed to operate without other software packages and independently assume control of the computer system.

- Data Base Distribution and Data Concurrency—Military unit independence, decentralized structures, and rapid deployment/redeployment can lead to differences in a seemingly standard COTS/NDI data base program.

• Obsolescence—The product life and, hence, the product support of COTS/NDI for commercial applications is typically far shorter than for military applications. Three to five years to product obsolescence for a commercial product, versus a 20-year military product life, are common. The support implications are obvious.

• Standardization—History (e.g., the WWMCCS Information System, WIS) has shown that the objectives of initiatives such as CHS are difficult to achieve in the information processing field because of the rapid advancement of technology.

• Configuration Management—The contractor has control over and therefore knows the configuration of equipments and software up to the time of delivery. However, configuration control of fielded equipment and software is impossible for the contractor to maintain. Configuration management of delivered systems has to be the responsibility of the government.

CRITERIA FOR FIELDED SYSTEMS

To help address the ILS issues resulting from the use of commercial software packages, criteria should be established for the systematic incorporation of new COTS/NDI releases by Army personnel. The vendor issues of data, warranty, training, release-to-release compatibility, configuration management, etc., can be addressed by these criteria. The design criteria in the use of COTS/NDI software packages in application systems should also be addressed.

NEW TECHNOLOGY INSERTION

To address the issues of new technology insertion, the Army should continue the support of software transportability through Ada language and Operating System (POSIX) changes that eliminate or minimize any new development necessary to rehost software systems. The objective is to allow replacement of a computer system or its hardware parts with new technology without requiring the redevelopment of existing applications.

IMPROVEMENTS NEEDED

Existing procurement policy should be flexibly applied to the procurement of off-the-shelf software systems. In the procurement of COTS items, such as the Desktop I, II, and III contracts discussed earlier, the Army bought a commercial hardware/software package with little or no new software engineering. On the other hand, an NDI integration such as MSE required the integration of multiple vendor software packages and the development of application software to make the total system function. This certainly would suggest that the development contractor

should be required to sign up front for support of the systems operating and applications software for the expected system life cycle.

In the Desktop example, software improvements that may be needed and are readily available can simply be bought as COTS. However, a high density NDI adaptation or integration brings questions concerning licensing, warranty, rights, and restrictions to rights. Trying to work these questions within standard (non-NDI) procurement policy is a recipe for failure. Policy and specifications should be changed to recognize the uniqueness of COTS/NDI software procurement.

COTS/NDI software packages reduce development cost, development risk, and development time. All of these advantages will surely benefit the government when revised guidelines are created to accommodate COTS/NDI software procurements.

An NDI software package utilized in a software application system should be identified as a Computer Software Configuration Item (CSCI). The design contractor should have the responsibility for all design consequences resulting from the use of a software item, including system performance, interfacing of software items, functional characteristics, and data issues. This design contractor should also be responsible for providing ILS for software items consistent with contract ILS requirements. And, the software package should be delivered as an independently visible product such that later versions can be procured directly from the vendor by the government and installed in the application system.

In summary, COTS/NDI procurement of software products can work and is working. As COTS/NDI becomes an established and practiced procurement alternative, the process can be more effectively evolved by incorporating the following guidelines:

- clearly define non-developmental software;
- clearly define contractor responsibility for software development and support;
- develop appropriate methods and standards to ensure compatibility of subsequent software enhancements; and
- establish procedures for incorporating software changes in the Post Deployment Software Support (PDSS) phase of a program's life cycle.

INTEGRATED LOGISTICS SUPPORT

GENERAL

ILS is an area of critical importance and can result in the success or failure of a program. Typically, major emphasis is placed on ILS during the government's evaluation of contractor proposals; however, the Army often fails to state the requirement clearly and accurately. This section identifies problems and suggests certain actions to improve ILS.

REQUIREMENTS

During the requirements generation phase of a program, the Signal School with the PEO's/PM's and CECOM should:

- Identify the program as developmental or COTS/NDI.

- Determine if the system is classified low or high density.

- Evaluate and identify the required level of maintenance.

- Access interim and long-term support concepts (spares and maintenance).

- Ensure that the real user participates in the decisions made relative to ILS requirements.

The following hypothetical example is instructive in viewing the ILS requirements:

- A requirement is developed by the Army's 11th Signal Brigade for a transportable multimode communications system. The system must provide communications (both secure and nonsecure), voice, and data in HF, UHF, VHF, and SATCOM.
- Based on an industry survey, the technology and prime equipments exist to fulfill the requirement. The procurement will result in a buy of COTS/NDI.

- The user determines the level of maintenance for organizational, direct, and general support. Contractor or depot support must be analyzed.

- The total quantity procured plus an evaluation of potential follow-on will determine if a low-density or high-density program exists.

•• If a low-density program exists, the Army must tailor ILS requirements and would likely require long-term support commitments from contractors.

•• If a high-density program results, the depot support decision will require a Level of Repair Analysis (LORA) to determine if the contractor or the government should develop depot repair capabilities. Initially, contractor support should be implemented until long-term support decisions are made and implemented.

Only after these essential ILS issues have been properly analyzed and decided upon should specific provisioning, technical manual, training, field service, etc., be determined.

INITIAL SPARES

In COTS/NDI procurements, initial spares should be identified and procured concurrently with prime equipment. The full provisioning documentation, which normally serves as the basis for buying spares, will likely not be available early in the program. However, the contractor can obtain sufficient information to provide a recommended initial spares list.

In many instances, a follow-on interim buy of spares may be necessary. The lengthy provisioning cycle precludes timely procurement of spares.

PROVISIONING

The current provisioning process is long and cumbersome. Provisioning is a vital part of system support, and yet the process precludes the timely procurement of essential spare parts.

COTS/NDI programs should be allowed to follow a more streamlined provisioning process. The utilization of the Short Form Provisioning Parts List (SFPPL) should be used when contractor support is the long-term support decision. A full top-down breakdown PPL should be used only in high-density programs that will be maintained over the long-term by the Army. Even in this case, there is often equipment in Army systems that was previously used and "fully" provisioned by other DoD agencies. Because each branch of the Service has its own provisioning systems that do not easily interact, the task is often duplicated.

The Army should also explore the real need for National Stock Numbers (NSNs) in COTS/NDI programs that are contractor maintained. The assignment of NSNs is probably one of the most timely processes of provisioning.

ILS personnel should review and make a flow diagram of the provisioning process specifically for COTS/NDI. Nonessential steps must be deleted and essential steps streamlined.

TECHNICAL MANUALS

The Army should encourage the use of existing vendor manuals wherever possible, especially in the area of COTS/NDI. Costly resources are currently being needlessly invested by the government in rewriting fully adequate manuals to conform to a specific MIL STD format.

CECOM technical publications personnel make most decisions for program technical manual requirements. These decisions often exclude user input. Manuals are usually developed, validated, and shipped to the user with no user input or review. This situation often results in costly revisions and delays.

Army operators and maintainers should be stating the requirements and verifying that the essential information is provided, especially for organizational/unit-level repairs and direct support. An example is the Maintenance Allocation Chart (MAC). The MAC dictates the level of maintenance. The CECOM Maintenance Engineer or Electronics Technician typically works with the contractor in developing the MAC. It is not uncommon for the MAC to undergo numerous revisions, because CECOM Maintenance Engineering frequently changes the maintenance structure.

The MAC also governs the PPL; therefore, MAC revisions usually result in PPL revisions. Many Army users say they never use the MAC. It would be more cost-effective if the Army maintenance personnel were to be given a decision making role in the selection of the maintenance structure and its related documentation. Further, CECOM's conventional repair philosophies and techniques may be obsolete for COTS/NDI programs. How often has CECOM reviewed the current technical manual standards and compared those to what the users would prefer in order to operate and maintain COTS/NDI systems and equipment?

SOFTWARE MAINTENANCE/SUPPORT

For COTS/NDI programs that rely on contractor-developed software, the Army should evaluate software maintenance and support in a similar manner as hardware. Low-density systems would be better served by long-term contractor support. The government often hesitates to rely solely on contractors for such support; or, the government may opt for contractor support, but pay costly fees to have software documentation reformatted in Government Standard 2167A. Many contractors believe that 2167A is obsolete and should be updated and streamlined.

Contractors would likely be more receptive to developing internal IR&D software to government standards if a more efficient and less costly documentation standard existed.

In high-density programs that have long life cycles, the Army will likely elect to maintain and support software on its own. In this case, data rights become an issue not only with the prime contractor, but also with the subcontractors. It is unrealistic for the Army to expect industry to develop COTS/NDI systems and equipments with discretionary funding and then relinquish its design rights so the Army can develop its own maintenance and support capability. Typically, data rights, redocumentation, and training for the Center for Software Engineering at CECOM is very costly. Perhaps front-end planning for software support should be evaluated by the Army during the RFP stages of the program. Equitable cost tradeoffs between contractor and government maintenance and support should provide the best long-term support approach.

TRAINING

COTS/NDI system training lacks an organized, comprehensive systems approach. Often, a COTS/NDI procurement involves an accelerated fielding schedule. Because little or no development is normally required, the program is often viewed as relatively straightforward, with short and simple operational and maintenance training requirements. In the hurry to field such equipment, users are often rushed through courses that are too short and lack enough "hands on" training. The result is frustrated students who believe that the system or equipment is not suitable for its intended purpose.

For high-density programs, contractor training should be strongly considered to assist the Signal School in training the trainers. GTE's responsibility to the Signal School for MSE training is a case in point. In low-density programs, follow-on or on-the-job training should be continued for an appropriate length of time. This service can be arranged with the contractor in the form of training options or field service engineering.

BUDGETING

Inadequate ILS often stems from funding deficiencies. More emphasis should be placed on adequate budgeting for COTS/NDI support activities. If the prime equipment exceeds the total available budget and precludes adequate ILS, the result will be fielding delays, with criticism and finger pointing erupting between CECOM and the Signal School. Contractors have often been blamed for these types of fielding delays.

TESTING

GENERAL

The testing of a product to ensure compliance with applicable specifications can cover the range from routine and simple to exhaustive and complex. The depth, duration, and frequency of testing are usually significant cost drivers of the total price of a product and should, therefore, be prudently selected at the outset of the acquisition process. This is especially relevant in COTS/NDI programs, because the anticipated cost savings can be substantially diminished by inappropriate or unnecessary testing requirements. This section will identify some specific testing guidelines that would serve to improve efficiency, cost, and confidence in expanding the COTS/NDI process.

PRODUCT WARRANTY

Many products available in the commercial marketplace have a long-standing reputation for being of the highest quality. Often these products are sold with a warranty that protects the buyer in the event of failure due to workmanship or defective parts. Responsible manufacturers of such commercial products commonly engage in quality assurance practices that have a direct parallel with the most rigid military requirements for reliability.

In spite of a favorable history with the product and its manufacturer, there is a tendency on the part of the government to impose yet another layer of testing that is likely to be superfluous and therefore wasteful. Rather, the government should accept commercially available, proven products produced by a reputable manufacturer solely on the basis of the product warranty.

Whenever the government pursues a warranty, the path to its realization should be short and unencumbered with bureaucratic details. Additionally, consideration should be given to providing a warranty service directly to the user as in most commercial transactions.

Gaining units should also share in any warranty bill-back arrangements with contractors. The current CECOM methods of returning such funds to a general government account diminishes the units' enthusiasm to participate in the warranty process.

LIBERALIZED TESTING

Items that are repeatedly purchased by the Army or its contractors are often subjected to the same special test procedures that continue unchanged year after year. As the experience factor for such items is developed, certain steps or even

entire portions of the test procedure can be eliminated because of redundancy or an exceedingly high rate of failure-free testing.

It would seem reasonable to limit the testing of well-established COTS/NDI products to only the most critical performance features and revert to a more liberal sample plan for complete testing.

USER INVOLVEMENT

The early and continuous involvement of the user in establishing and executing test plans and procedures throughout the acquisition and fielding phases of COTS/NDI programs can be of immense value. In the absence of the user, test requirements can cascade into monumental and costly exercises that do not contribute to product reliability or performance. The user is perhaps the most sensitive and knowledgeable party in the chain of entities assigned to a program. Regrettably, the user usually does not appear until the equipment is ready for fielding and Follow-On Test and Evaluation (FOT&E) is about to begin.

By ensuring early user involvement in testing prior to FOT&E, the duration and cost of FOT&E can be reduced considerably.

ENVIRONMENTAL STRESS SCREENING

A number of NDI products and systems are procured by the Army or its contractors with a Production Reliability Acceptance Test (PRAT) requirement. PRAT is usually an annual or lot-based environmental test of a small sample that ensures that parts, materials, and manufacturing processes are maintained at a level consistent with first article or qualification testing. Even though PRAT has successfully revealed deficiencies in parts or workmanship, such facts are often confirmed only after a lengthy investigation, by which time a large quantity of equipment has been produced and fielded. Corrective actions can continue for years following the discovery of a defect, and many times only a small fraction of the defects are corrected.

For some classes of NDI, particularly those involving tactical applications, it would seem far more advantageous to impose Environmental Stress Screening (ESS). Generally, this would mean that every item would be subjected to some level of environmental testing as the items are produced. Deficiencies would become visible within days after the equipment is produced, and corrective action could be taken at the contractor's facility before the goods are shipped to the Army.

While some contractors have voluntarily imposed an ESS program as a means of reducing the likelihood of PRAT failures, the Army does not readily accept ESS as a substitute for PRAT. Therefore, many contractors revert to PRAT as their

only environmental test. The consequences of PRAT-only testing have proven costly for the Army and the contractors.

As a means of maintaining product integrity and performance throughout a multiyear procurement, the Army should accept ESS as an alternative to PRAT. The cost and reliability tradeoffs of ESS versus PRAT should be strongly in favor of ESS from the viewpoint of both parties.

TEST-FIX-TEST

COTS/NDI equipment, software, and systems produced strictly in accordance with prescribed specifications and standards frequently fall short in some manner early in the fielding process. In spite of the most carefully formulated design and implementation planning, the contractor needs to be allowed some latitude to take early corrective action to fix problems. A prudent program manager will include such a task in the program plan before subjecting a product to formal, Army-controlled FOT&E.

Rather than leave this area open to the discretion of the contractor, it would be far better for the Army to designate the first (or first few) systems ready for fielding as engineering validation and verification (V&V) units. There would be a specific task calling for a planned contractor fix period, during which system failures and shortcomings could be corrected following V&V testing. This kind of a test-fix-test approach would greatly enhance the likelihood of successful FOT&E and, in turn, more timely and cost-effective fielding.

PROGRAM MANAGEMENT

GENERAL

Today the acquisition process must maximize its use of COTS/NDI in order to meet increasingly more severe time and budget constraints. The proper use of COTS/NDI can foster wider use of state-of-the-art products while providing evolutionary growth paths for future improvements.

PROCUREMENT PROCESS

One specific item in the area of COTS/NDI that could help to streamline the program management function is in the procurement process itself. In an R&D procurement, programmatics have been established for the review and approval of design, documentation, and implementation. A COTS/NDI program should address the use of a modified process that provides the government program office with the authority to make decisions in a timely manner. The simplest and most direct approach to achieving such a change is in the procurement phase. Once the contractor has provided its design in the proposal, that proposed design is placed under contract. In doing this, the need for detailed design reviews is negated because the design was agreed to up front, thus reducing the time that would have to be set aside for these reviews. Program reviews would still be required for tracking progress, but they would not be required for establishing a baseline design.

BASELINE CHANGE

Another area that can be improved involves baseline change. With its limited schedules, a COTS/NDI program should basically be considered a no-baseline-change program. This can be better handled by providing specific points in the schedule when possible changes can be recommended for adoption. It should be remembered that even a minor change can have both cost and schedule impacts on a COTS/NDI program when there has been a mandated baseline.

RESPONSIBILITY

Total program responsibility includes engineering, production, logistics, quality control, and depot and field support. The best utilization of personnel, schedule, and budget would be gained by requiring the contractor to design, produce, integrate, field, and then support the system. During the various stages of the program, the contractor and the government program office should study and recommend various approaches that are cost-effective for the transitioning of activities from the contractor to government support organizations. These studies should address the items that have cost/schedule impact on the various phases of the program and provide recommendations to the government. This total

responsibility concept provides the government with the expertise and experience gained by the contractor during the design and production processes. Merging that with field and support data will provide greater insight into selecting product improvements.

DOCUMENTATION

Another area that is very costly and time consuming is documentation (CRDLs). Until now, most of the program requirements have been developed around the conventional R&D procurement process. Today documentation is generated and reproduced at an alarming rate, frequently being deposited on a shelf somewhere. Documentation should be reviewed and justified as an important need before being routinely required by the contract. Additionally, the format of the documentation should be reviewed and analyzed to determine if it meets the needs of those who require it.

An example is the maintenance documentation. One might question why a contractor should create a maintenance manual in a very rigid format if the commercial version of the document is what the maintenance-level personnel are using on their personal equipment at home. In software it is even more important, and the natural question would be, "Why should a contractor purchase documentation and rights from a commercial vendor for the source code of a product when that product is not and never will be maintained by either the contractor or the government?" These two examples provide areas where smart decisions can reduce the cost of a program.

To be even more cost effective, the contract should contain language that would allow for the modification of CDRLs after award, thus taking advantage of future changes to both standards and commercial documentation. Another related problem in the documentation area is the time required for the review, approval, and reproduction of documents after delivery to the government. In some cases, multiple system changes have been made before the original document was released by the government's printing office.

CONTRACTOR SUPPORT

No matter how much testing is done on a system prior to fielding, not all of the potential problems can be identified and corrected. For this reason, the contractor should be required to support the system after deployment for a reasonable amount of time. The contractor not only knows the system well enough to correct problems, but is also able to provide real-time insight into possible design enhancements under consideration for future implementation. When the contractor is involved in system maintenance, he also takes a greater interest in supportability aspects of the program.

COORDINATION AND COOPERATION

Since COTS/NDI programs are normally based on very tight schedules, it is imperative that the government program office and the contractor have a good working relationship. A method of establishing this kind of relationship is to provide a program office representative of the team on site with the contractor to address issues that may arise. When changes are identified that will impact cost or schedule, the program office has immediate insight into the change and thus can implement the change in a timely manner.

In many programs, contractors must utilize government facilities and equipment when required by the contract. Such facilities and equipment must be in good working order. Otherwise, the contractor and the government incur considerable expense and schedule delay.

CASE STUDIES

CASE STUDIES

GENERAL

During the study effort, two case studies were developed to review the current procedures for acquisition and to make recommendations for improvement. The two equipment items selected for review were:

- Small Lightweight GPS Receiver (SLGR), appropriately nicknamed "SLUGGER."

- Common Hardware/Software (CHS).

SMALL LIGHTWEIGHT GPS RECEIVER (SLGR)

The SLGR was born out of necessity during Operation DESERT SHIELD/STORM when the Army wanted an immediate solution to navigation and position location problems it was experiencing in the desert with its small units and vehicles. The SLGR is a receiver used in conjunction with Air Force satellites as part of a Global Positioning System (GPS) navigational tool to provide X, Y, Z positioning of designated targets as well as time. It had amazing success in Operation DESERT STORM where its use constituted a joint services effort with the Air Force as the lead Service. This procurement was conducted through the Joint Program Office (JPO) at the Air Force's Space Systems Division in Los Angeles. The SLGR was a previously competed procurement intended for use in a maritime environment.

Four units were built and demonstrated by two companies:

- Trimble Navigation
  Sunnyvale, California

- Magellan Systems Corporation
  Monrovia, California

The original specifications included a four-year warranty which was not imposed on the Operation DESERT STORM procurement.

Operation DESERT STORM users were familiar with GPS capabilities and had an urgent need for the equipment, mostly because of a lack of accurate existing navigation charts in the Persian Gulf region. In addition to being procured as an NDI product, the procurement was also tagged with the "Limited Production Urgent" (LPU) label.

The original SLGR equipment specification carried a COMSEC encryption requirement. That requirement for this procurement was waived by executive signature from OSD C3I. CECOM records reflected that the following numbers of SLGRs were procured by PEO, Combat Systems:

- Trimble Navigation - 7,243
- Magellan Systems Corporation - 400

No logistics package was procured by the Army. The maintenance philosophy was basically Contractor Engineering Technical Services. Two manufacturers' representatives were contracted to be on-site to perform maintenance and operator training. Operator training was simple and usually of 2-3 hours in duration. Existing operator and maintenance manuals were available and used for operator training and maintenance. There were no spare parts or SLGRs procured as spares. An Army/contractor hotline was established that was used only for peculiar situations that arose during maintenance and operator training or in actual SLGR use.

Out of the total quantity procured, 3,000 units were actually deployed. Thirty units, or 1%, required maintenance actions. Approximately half of these were, "Could Not Duplicate" (CND) or, "ReTest OK" (RTOK).

The procurement was deemed a very successful endeavor because of the high level of user satisfaction. The general consensus was that the urgency of the situation and the familiarity with the product quickly gained by the users eliminated much of the usual "red tape."

COMMON HARDWARE/SOFTWARE (CHS)

The Common Hardware/Software (CHS) System consists of a combination of a Hewlett Packard off-the-shelf Central Processing Unit (CPU), and a monitor and Miltope peripherals, with a mix of operational software. Users were tasked with development of their own application software. The combination of equipment and software were used in the Persian Gulf as a Networked Battlefield Condition Management System.

Two versions of hardware were procured.

- V1 - Standard, non-ruggedized version
- V2 - Ruggedized version (Green Box)

Equipment specifications were generated by the government with an eye toward COTS/NDI equipment, but this procurement was NDI from its inception. It

was a total package procurement, and the winner was chosen based upon price and maintenance approach.

A limited logistics package was procured. The prescribed maintenance concept was:

- Remove and replace LRUs at "O" level CPU; monitor and peripherals were considered LRUs.

- Send faulty LRUs to intermediate direct support for test in a hot mock-up.

- Mail faulty LRUs to a Contractor Regional Repair Center.

- Procurement set up initially as a continuing contractor support.

Hewlett Packard and Miltope teamed for training on the basic use of Networked Management and Battlefield Condition Monitor. The original contract included Instructor and Key Personnel (IKP) training, but this was never exercised. There was no LSA/LSAR purchased or imposed on the program. In retrospect, many of the program participants indicated they felt some amount of LSA/LSAR would have paid dividends.

There was no provisioning requirement in the contract. At program inception, the contractor team tried to apply a best practices provisioning contract and found there was no such thing in existence. The procurement included LRU spares only.

A warranty was imposed as follows:

- The using command paid "X" per month per unit to the Regional Repair Center which had the total responsibility for repair and Turn Around Time (TAT). The Regional Repair Center supplied the repair parts. The TAT was fixed at five days in and out of the Repair Center door exclusive of shipping time.

- The program experienced approximately 36%-CND/RTOK from all maintenance actions. There were availability problems created by the units not meeting their reliability predictions. Much of the problem was caused by the lengthy shipping times, which added to the contractual TAT.

COMMENTS

In retrospect, it appears that both programs could have been better served with some up-front accelerated logistic analysis. With state of the art technology, and with much of industry geared to functioning in a Concurrent Engineering (CE) or Integrated Product Development (IPD) environment, it appears that simulated support scenarios could have been rapidly evaluated. The likely result would have been some minor modifications to the existing equipment or to its support concept, which would have enhanced product supportability.

COTS/NDI oriented contracts should encourage contractors to propose state of the art enhancements to fielded equipment. These proposals would be accompanied by tradeoff analyses showing life cycle cost savings versus contract price increases. The contract should allow for acceptance of enhancements or product improvements as modifications to the contract as opposed to the normal practice of starting a new procurement cycle.

With the advent of Computer-aided Acquisition and Logistic Support (CALS), a limited on-line provisioning system can be instituted and utilized in conjunction with the Paperless Order Placement System (POPS) to select and provide required spares. It appears that both case studies would have benefitted by a more sophisticated provisioning program, rather than the normal, full blown, lengthy provisioning process.

There is concern from some quarters in the Army that because the SLGR was not tested against its original requirement, the system should now undergo such a test. If so, it would fail because of the absence of a secure capability. It would appear logical that if such a system underwent battlefield conditions and proved itself in a combat theater, it hardly seems necessary that there be any more testing. Moreover, it would also appear that the waiving of the security requirement should prompt a change to the requirement itself. Testing for testing's sake appears highly inappropriate here. Is there a need for the unsecure SGLR? That question was answered by the field commanders during Operation DESERT STORM. Is there a need for a secure version in lesser quantities for use against a more sophisticated foe? Probably, yes.

The matter of warranties suggests special consideration for COTS/NDI systems. The Army could stipulate a given MTBF, and, since the contractor has performed at that level with the commercial product, the Army could have the contractor execute a warranty in which he would agree to replace, at no charge to the government, any systems that did not meet the stated MTBF. In turn, the Army would agree to no testing of the item already proven in commercial use. This would minimize the risk to the Army while making the offer equally attractive to bidders.

CONCLUSIONS

CONCLUSIONS

GENERAL

The concept of applying commercial products to meeting military needs is a notable one with regard to accelerated acquisition, reduced R&D costs, and applying state-of-the-art technology. The acknowledged disadvantages of COTS/NDI are performance compromises, supportability unknowns, and limited design data. Obviously, COTS/NDI acquisitions present certain challenges, such as:

- The user may have to relax his requirement.
- ILS activities may have to be a shared responsibility.
- Proliferation of proprietary hardware and software may result.
- Safety deficiencies may have to be accepted.
- The current authorization and approval process must be expedited.

The combat developer's challenge is to generate realistic requirements and, in so doing, eliminate overstated requirements, relax specifications when appropriate, coordinate requirements with industry, and provide for growth potential. The materiel developer's challenge is even greater. He must defeat the "not invented here" mindset by:

- Being a true "honest broker."
- Being the technology base for the user's need.
- Knowing the marketplace.
- Educating the acquisition community on NDI approaches.
- Reducing testing and retesting.
- Using more functional specifications.
- Relinquishing the need to maintain data rights.

The logistician's challenge in NDI system acquisition and fielding is to ensure that the system can "go to war" by being logistically supportable, using interim or permanent contractor support, and adopting a throw-away logistics concept. The contractor's challenge on NDI is to provide a proven (by test and performance)

product or component, guarantee low risk to the government by warranty or other instrument, ensure a stable source of spares, identify parts and components covered by proprietary rights, and be aggressive in offering technology insertions during the life of a system.

The defense industry gets frustrated quite easily with the way the Army does its business in the area of communications and electronics. Specifically, the following observations tell the story:

- The current acquisition system is inflexible, bureaucratic, and ponderous.

- User involvement throughout the process is inadequate.

- The COTS/NDI approach looks much like the developmental approach.

- The Army seems reluctant to change.

Although the Army has made some major recent commitments to COTS/NDI, there are still many naysayers and entrenched functional entities that do not appear to believe in COTS/NDI. These are well meaning participants in the procurement, testing, and logistics fields that cannot, or will not, change the way they do business. If the Army does not get these critically placed mindsets changed, the COTS/NDI initiatives will be outlived by the naysaying bureaucrats.

The Congress, the Department of Defense, and the Army have all advocated the buying of commercial products that can be readily adapted to military needs, thus saving in cost of development, in time to field an item of equipment, and in the resources required to sustain that equipment in the field. To date, there has been no discernible effective direction in applying commercial technology and practice to military applications.

The U.S. Army has not aggressively pursued COTS/NDI approaches as directed by the Congress and as frequently espoused by senior Army leadership. Industry has all too frequently urged the Army to exercise a bold stroke of leadership from the top, i.e., to direct by regulatory change or by fiat for the various agencies involved in requirements generation and material acquisition, to make the acquisition community change its mindset and, if nothing else, try adopting COTS/NDI approaches to prove the validity or uselessness of that approach.

The problem of not taking advantage of the acquisition and fielding of COTS/NDI equipment can also be considered a defense issue of affordability. If COTS/NDI approaches were applied to equipment that would interoperate between

the Services, the savings would be substantial. This certainly pertains in the C³I area. Indeed, the argument can be made that CECOM should join with other agencies in transitioning Army tactical command and control systems and management information systems to ISO standards. Such a move would free the Army from some of the obsolete technology that it still uses. Once done, common interservice supply and maintenance support should be implemented.

In an attempt to create maximum survivability with its equipment, the Army exacts a high price by insisting on environmental extremes in its specifications for an item of equipment. Coupled with the notion that each item should be militarized to the maximum extent possible, this combination of unnecessary environmental and appearance/performance specifications wipes out any opportunity for fielding an item of equipment quickly and at less cost.

The Army militarization philosophy refers to its persistence in using military specifications and standards where it does not really need them. There are still large numbers of people who would militarize everything the DoD uses. Conversely, to buy commercially available items whenever possible would be cost effective in almost all cases. Eliminating unnecessary performance specs might engender an enthusiastic industry response without adversely affecting performance.

Commercial or nondevelopmental items should be used whenever possible. Not every items of equipment should go through a full and tedious R&D cycle. This is particularly true in information systems where the competition in the commercial marketplace provides plenty of its own stimulus for better and more economical products. Except for large quantity items like combat net radios, the Army's requirements are small when compared to the user market that drives commercial industry. The Army should take advantage of this.

Buying off the shelf allows the Army to introduce more current technology into its inventory. Its usual practice has resulted in fielding equipment after 12-15 years in the development process, only to realize that industry has produced three or four new generations of equipment on its own just to keep pace with commercial marketplace competition.

Contractor support for COTS/NDI equipment has not always been accepted as the preferred solution. When it has become the norm, such was generally directed by a senior military or civilian official. Left on their own and without high level supervision, the tendency on the part of mid level managers in CECOM is to put the responsibility for support of the COTS/NDI equipment on the military (uniformed and/or civilian) and forego contractor support.

When senior military become involved in the acquisition process for COTS/NDI equipment, they seem to be smart enough—and strong enough—to

direct other than a form, fit, and function approach to system development. They too seem to represent the few who want to place a COTS/NDI system under contractor logistics support. How this senior level philosophy can be transmitted to the lower levels of management in the Army is a matter the Army should address.

Reasonable trade-offs of requirements can occur when the "real user" and the PEO/PM and CECOM bypass the conventional acquisition process. This argues for a greater role for the field user in the acquisition process. Getting him to understand that contractor support can indeed work might allay any fears to the contrary.

THERE ~~Then~~ seems to be a mindset in CECOM that total, full support in accordance with the routine military logistics support system is the way to go. A fundamental change in outlook, approach, and process, will have to occur before substantial progress is made in obtaining greater contractor support.

To change the mindset, the Army will likely have to write a separate regulation for COTS/NDI acquisition, fielding, and sustainment. This will provide the proper baseline or environment in which the CECOM civil servant operates. Given a new set of regulations which become his "cookbook", there will be little deviation from what is prescribed in that set of regulations on how to acquire and support a COTS/NDI system.

To help change the mindset, the DSMC should teach its students that in the COTS/NDI domain, they should look at a situation from a "good business decision" point of view. This will help overcome the traditionalist approach. These students who will form the new Acquisition Corps have the potential of making a badly needed impact change on the way the Army has been conducting its materiel development business. As new middle managers, they will have to be the ones to drive home to the lower level support personnel at CECOM that as far as COTS/NDI is concerned, "change" is the name of the game.

REQUIREMENTS

In the formulation of requirements, the Signal School as the combat developer follows a well established process, to include full justification for supportive need. At the very outset of the acquisition process, the requirements generation aspect can help or hinder a COTS/NDI approach. If the Signal School provides too precise a requirements document into the system, the chances of going the COTS/NDI route are reduced. Therefore, the Signal School should strive to portray its requirements in terms of broad parameters, thus affording industry a greater opportunity for providing a wide array of solutions to the user's problem.

The Signal School should continually strive for realism in its requirements developments, especially in COTS/NDI conditions. By pursuing requirements in a generic sense and then exercising good requirements configuration management during the life of the system the process should be aided and efficiencies gained.

A good, substantial, and continuous dialogue between the user and the developer will have a salutory effect on the entire process. Such does not always occur today. The Signal School is responsible for trade-off determinations and the route to pursue in training logistics support; hence, it should maintain a close link with the PEO/PM and CECOM. Conversely, the PM is striving to produce a needed item of equipment for the real user. Therefore, he has an obligation to maintain a constant dialogue with the user's representative, as well as the contractor.

The Signal School could play a stronger role in the COTS/NDI process by participating in market investigations. This would enable the combat developer to learn what industry has to offer to meet his requirement. It would definitely broaden his base of knowledge on potential solutions to his requirement.

Discussions on fielding and sustainment should definitely involve the combat developer and the real user. These two are the ones that have to put the system into operation. CECOM should, as a matter of practice, proceed into fielding and sustainment discussions and decisions only in concert with the Signal School.

The absence of experienced combat developers in the Signal School hurts the COTS/NDI process, because it tends to leave decisions in the hands of a few engineers, scientists, and logisticians in CECOM who, by default, make decisions that suit their experience or personal needs—not necessarily what is expedient for COTS/NDI fielding. Experienced combat developers would know how to deal with this and would tend to bring a researched approach to the acquisition and fielding of COTS/NDI equipment.

The departmental responsibilities of DISC4 and DCSOPS pertaining to C4 matters continue to be a source of friction. These matters should be addressed in

order to give the acquisition process the efficiency it must have to be successful, especially where COTS/NDI is concerned.

HARDWARE ENGINEERING

To allow industry the freedom to meet the user's stated requirements, the PEO/PM and CECOM should develop their specifications in operational and functional terms at the system level. Differentiation between COTS/NDI and developmental acquisition should be recognized, especially as regards CDRLs for COTS/NDI and systems that require Type Classification.

COTS/NDI equipment should be used as supporting platforms for special applications such as workstations. Where at all possible, commercial and international standards should be used, thus precluding the use of MILSPECs where not required.

CECOM should specify and use commercial documentation to support the maintenance requirements formulated by the user. Where necessary, such documentation can be supplemented.

In keeping with the philosophy of COTS/NDI, CECOM should undertake good up-front planning to reduce specifications in COTS/NDI RFPs to the absolute minimum. Automatically requiring a contractor to adhere to a specification contradicts the purpose of COTS/NDI and simply should not be permitted. This is particular true of environmental specifications that can drive costs up markedly.

There is an excessive review and processing by PEO's/PM's and CECOM of change requests. COTS/NDI equipment should be provided with a minimum of bureaucratic impedance. If PEO's/PM's and CECOM maintain a constant dialogue with the contractor, the ease with which change can be made should be maximized. Contracting officers should be instructed that COTS/NDI processes permit such efficiencies.

CECOM should avoid unnecessary involvement with internal contractor documentation. It should focus on key issues of contract management and leave the contractor alone to bring the system on line.

By gaining a greater dialogue with the contractor, the PEO'S/PM's and CECOM could be more open to the contractor's creative solutions. In addition, by fostering a greater dialogue and more frequent contact with the real user and the combat developer, the chances are that the contractor can generate cost savings, new approaches to equipment usage, and the like. PEO's/PM's and CECOM must accept the fact that the contractor wants to satisfy all his customers. To do so, he must be in constant dialogue with them. Then, when a problem arises and a "fix" is deemed

to be appropriate, such change should be promptly accepted and implemented. Again, CECOM should ensure that its contracting personnel respond favorably to such logical initiations.

CDRL reviews by CECOM have become burdensome due to excessive interference by various parties. By providing a disciplined focal point to screen government comments, CECOM would definitely improve productivity.

If CECOM would adopt industry, international, and government standards in systems specifications, the COTS/NDI process would be substantially enhanced. Likewise, technical documentation should be permitted as opposed to military technical manuals. Here the user could and should play a key role in supporting the contractors documentation system.

COTS/NDI-oriented contracts should require contractors to propose state of the art enhancements to fielded items of equipment. Proposed trade-off analyses should be included. The contract should permit enhancements or product improvements as a contract modification to preclude having to undergo a new start.

SOFTWARE ENGINEERING

COTS/NDI software packages provide ready made system building blocks of features, capabilities, or data processing services. They reduce development costs and risks. They are readily acquired from vendors through license arrangements and warranty provisions. More often than not, combat and material developers do not fully consider pass-through implications in the licensing, warranty and restrictions.

In the procurement of software packages, CECOM often fails to describe how the COTS/NDI software is to be controlled. In addition, these packages are not identified as a separate computer software configuration item.

In the design process, when ambigiutv prevails, it is difficult to establish system performance requirements. The government should rectify this by specifying what those requirements should be. In addition, performance requirements should continue to be met by the vendor without modification to the software packages. Software structure mobility should be established by the PEO/PM and CECOM with the vendor.

CECOM should recognize the significant differences between commercial and military software applications in security, integration with application software, data base distribution and data currency, obsolescence, standardization and configuration management. In each case, full responsibility should be placed on the contract to enable him to rapidly deliver the equipment for testing and then fielding.

Minimum interference by the Army, unless absolutely necessary, can frequently guarantee an efficient acquisition.

New technology insertion should be a matter of course by the contractor. In this regard, CECOM should continue the support of software transportability through Ada language and POSIX changes. The redevelopment of existing applications should be avoided when maintaining new technology insertion.

Existing policy should be flexibly applied to the procurement of off-the-shelf software systems. Policy and specifications should be changed to recognize the uniqueness of COTS/NDI software procurement. The contractor should be given every opportunity to develop, field, and sustain the software packages as an incentive and for the expedience of a proven system.

In order to maintain the maximum benefit, CECOM should clearly define NDI software, clearly define contractor responsibility for software development and support, develop appropriate methods and standards to ensure compatibility of software enhancements, and establish procedures for incorporating changes in PDSS.

INTEGRATED LOGISTICS SUPPORT

The tendency has been to make few full-life cycle support exceptions in which the contractor would be given virtually full responsibility for spares and maintenance support. (MSE is one good exception.) One other perception is that CECOM logisticians would be reluctant to give the contractor greater support responsibilities for fear that to do so would ultimately result in less work at CECOM, and thus the loss of jobs. In order for COTS/NDI to work in the provisioning area, CECOM must be willing to accept more creative solutions proposed by industry.

ILS for COTS/NDI is often poorly planned. Early in a program's brief life cycle, the combat and materiel developers should jointly identify the program as developmental or NDI. Then they should determine if it is a low or high density system, identify the required level of maintenance, access interim and long term support concepts for spares and maintenance, and ensure that the real user participates in the ILS decisions. Purchasing or imposing a LSA/LSAR on a program would ensure completeness of logistics support. Simulated support scenarios could be readily used in this analysis.

Spares should be procured concurrently with the prime equipment. The Army's "data call" procedures should be modified to accommodate COTS/NDI procurements in this regard. With the advent of CALS, a limited on-line processing system should be instituted with COTS/NDI equipment.

For low density programs, contractor support should generally be adopted. For high density programs, a mix of contractor and government support may be in order. Each case should be treated individually. Cost and speed/ease of fielding should be on the minds of those making the decision.

Training should be carefully assessed, with the potential of contractor support a full consideration. Costs to the government in manpower and preparation time could militate against government supported training. In fact, ILS often incurs funding deficiencies, in which case more emphasis should be placed on adequate budgeting for COTS/NDI support activities.

TESTING

Testing of COTS/NDI equipment should follow a very different set of procedures than would be the case for developmental equipment. Unnecessary testing has all too frequently occurred, thus wasting time, manpower and funds. At the outset of the acquisition process, a determination should be made on simplified testing procedures, recognizing that the contractor has already tested the system in one fashion or another before it was used commercially. In these instances, warranties can become a medium of quality control by the contractor for the government. In fact, the government, (CECOM) as a matter of practice, should accept commercially available and proven products produced by a reputable manufacturer on the basis of the product warranty.

CECOM and TECOM should be more liberal in their testing of COTS/NDI equipment. They should limit the testing of well established COTS/NDI products to only the most outlined performance features and revert to a more liberal sample plan for testing.

Early and continuous user and combat developer involvement is critical. It is they who have the best understanding of the operational basis for system performance. Early user support will also shorten the actual test time, thus generating cost savings.

As a means of maintaining product integrity and performance throughout a multiyear procurement, the Army should accept ESS as an alternative to PRAT.

A test-fix-test philosophy should be adopted by CECOM to save time, manpower, and costs, Further, this would also enhance the likeliness of a successful FOT&E.

PROGRAM MANAGEMENT

COTS/NDI processes should permit the contractor to develop an item of equipment without a large number of reviews. A modified process should be adopted. Design reviews in particular should be obviated if the proposal design is locked in by CECOM. In addition, with its limited schedule, a COTS/NDI program should encompass some restrictions or change, such as a "no-baseline-change" condition. Where changes can be made, they should be reflected on the overall schedule just to exert some discipline in the process.

CECOM should look carefully at giving the contractor total responsibility for a program, to include design, production, support, and fielding. Such a total responsibility approach provides CECOM with the expertise and experience gained by the contractor during the design and production process.

Since documentation is such a costly and time consuming process, it should be reviewed and justified. Too often it sits on a shelf. Only if the government expects to compete a major program would it appear necessary to exercise control over the documentation. Such a reduction would be of enormous value to the contractor and represents a risk well worth taking.

The modification of CDRL's after award should be permitted to take advantage of rational changes. CECOM should find a way to permit such change without violating the content of the requirements document regarding performance desired.

CECOM should give priority consideration to the contractor providing support to the COTS/NDI program. Exceptions would be rare. This would make it incumbent upon CECOM to acknowledge that contractor support for COTS/NDI is the norm.

To facilitate a better government to contractor relationship, a representative of the program office should be placed at the contractor's site. In this way, changes can be coordinated and information exchanged far more readily.

OTHER STUDY CONCLUSIONS

In its research, the Study Team found that a fairly diverse set of agencies had come to similar conclusions. In view of the consistency of these themes, these conclusions are presented below.

In a pamphlet authored by William J. Perry for the Center for International Security and Arms Control, Stanford University, December 1989, entitled, "Defense Investment: A Strategy For The 1990s", the following comments were made

regarding the Packard Commission's recommendation on expanding the use of commercial products:

> The Defense Department appears to have moved backward since this recommendation was made, even though substantial savings, perhaps several billion dollars a year, could be realized if the Department increased commercial buying to its full potential. The Department has responded to the revelations of overpricing and mischarging by greatly increasing the number of inspectors, by de facto decreasing the authority of contracting officers, and by greatly decreasing the flexibility of program managers. In short, the Department is doing everything by the book, and acquisition personnel are understandably afraid to exercise judgment or take a course of action that could be criticized. In particular, program managers are reluctant to seek deviations from full military specifications which very few commercial products strictly meet, although many meet their intent. Similarly, contracting officers, with an eye to future contracts, are insisting on getting full data rights, which very few commercial contractors can provide, even if they are willing to. As a result, most potential commercial suppliers are disqualified on technicalities or procedural grounds from bidding, even if they have already developed products that meet the military's needs and are selling them at prices far less than could be realized for products uniquely developed for the military.

In May 1990, the Carnegie Commission on Science, Technology, and Government rendered a report entitled, "New Thinking and American Defense Technology." Excerpts from part VI of that report, which pertained to increasing defense use of commercial technology, are quoted below. Its observations and accompanying recommendations are consistent with the findings of the Study Team and seem to reinforce the views that fundamental changes need to be made:

> Research and development spending in private commercial industry and in other Western nations has been growing faster than defense R&D spending for decades. In many fields of advanced technology, the Defense Department is a bit player, both as a supporter of technology generation and as a customer for new technology. The resulting growing dependency of defense upon technology it does not develop itself can be turned to advantage if the DoD can learn to draw upon the commercial world for those technologies that are not uniquely military.
>
> Today, only a small percentage of components purchased by defense procurement offices are commercial 'off-the-shelf' products. Both the Packard Commission and the Defense Science Board have noted that,

as a result, the components in defense systems often embody old technology and cost more than their commercial counterparts. In semiconductor purchases, for example, a defense buyer pays as much as 10 times more than commercial buyers for equivalent and, in some cases physically identical, parts. The failure to use commercial components when their use has such obvious advantages stems from an overly rigid insistence on military specifications and from procurement regulations that discourage commercial suppliers from seeking defense markets. Correcting this problem would not only yield immediate cost savings in defense systems, but would strengthen the U.S. industrial base over the long term.

Perhaps most importantly, to the extent that our defense systems embody commercial components, our commercial industry would become an automatic 'reserve force' that could rapidly increase defense production in the event of national emergency. Moreover, employing widely used commercial components facilitates the continuing low-cost purchase of spare parts and the upgrading of systems by incorporating later-model, but compatible, components throughout the lifetime of a defense system (which is frequently measured in decades).

There are, however, formidable barriers to defense purchasing officers attempting to increase their percentage of commercial components buys. The barriers are military specifications, security regulations, and procurement regulations, all of which were established for good reasons, but whose application in this area has become counterproductive.

A recent study undertaken by direction of the AFS/AFLC Joint Commanders' Conference on March 22-23, 1989 was conducted by an AFSC/AFLC/AFCC Working Group on COTS/NDI supportibility. The study concluded that: supportability would be improved by the recognition of commercial item uniqueness, the Air Force should undertake new ways of doing business, and changes in mindset are needed. The recommendations of the study, quoted below, are consistent with those of this study.

Contractor Support Preferred Unless Mission Needs Are Not Met

Unless there is a reason why contractor support adversely affects the mission, contractor support should be used. The contractor retains configuration management and, thus, the knowledge and capability to let the item evolve without adverse impact to the system. Also, the contractor has already developed a competitively priced support capability for the item.

Apply Vendor Support Concepts Whether Support Is Organic Or Contract

Whether support is organic or contract, the Air Force should apply vendor support concepts to support commercial items. Rather than develop a support concept (e.g., repair to the SRU level versus the LRU level) that takes the government away from the commercial mainstream for that item, the government needs to follow vendor support procedures. This will require the government to define the support concept early, specify it, and select vendors whose support approaches meet government needs without modification.

Don't Modify Commercial Items

Do NOT, unless it is a coordinated decision that the best approach is to change an existing commercial item, modify commercial items. Modification causes the item to become a unique government item requiring sole source support; Only minor modifications (as defined in the DFAR) should be allowed. Any other modifications should require full life cycle cost analysis and coordinated agreement.

Up Front Support Requirements, Strategy, and Contracting for Commercial Items

Before the Request for Proposal (RFP) for the development/production of the system or item is released, government representatiaves should develop agreed-upon support requirements, life-time support strategy (including service life of the commercial item), and contract language.

Link Requirements Process to Market Analysis

The requirements process should be linked to market analysis in an iterative manner so that market realities can help determine cost-effective solutions. With up-to-date knowledge of current technology, it is possible to match requirements with market availability and make a knowledgeable assessment of whether needs can be met with existing commercial items, whether requirements should be reshaped to what is commercially available, or whether a developmental program is needed.

Acquisition Agency Fund Initial Support of Organically Supported Items

Due to the fast pace with which commercial items can be fielded, funding for the organic support of commercial items needs to be provided to the acquisition agency. This should include iterim

contractor support (ICS) and funds to support TDY needed to complete up front support planning.

Modify Cataloging Process and Standard Base Supply System (SBSS) For Commercial Items

The Cataloging and SBSS are geared towards developmental items. The manual workarounds to include commercial items are time-consuming. To ensure effective, efficient cataloging and use of government-owned spares for commercial items, a two-phased approved is recommended: (1) Prepare a handbook containing existing commercial item information already in the regulations, standards, etc., so the information is in one readily-available place; and (2) modify the automated systems to accept commercial items with the vendor data supplied and code it as commercial to alert users that the configuration management is controlled by the vendor.

Emphasize System Integration Tools to Meet the Engineering Challenge for Commercial Items

Emphasis needs to be placed on system integration in the acquisition phase and sustaining integration in the support phase for systems containing commercial items. To avoid modifications of commercial items, it is important to plan the architecture of the system such that changes can be made outside the item and not affect its capability or performance.

Training to Change Developmental Mind Set and Improve Skills

Training is needed to teach people to think of commercial items as having their own set of acquisition and support processes different from developmental processes. Also, training on the requirements, acquisition, and support tools and processes for commercial items is needed.

Identify Market Analysis Functions In Acquisition and Program Management Agencies

The establishment of a market analysis function would provide the government a disciplined approach to gathering information and data about marketplace technologies/products (market surveillance) and in gathering more detailed data when responding to a specific need outlined by the user (market investigation). Thus, there would be an improved product awareness (new technology, obsolescence) as well as

valuable assistance to the user in matching requirements with market availabililty and in determining cost-effective solutions.

Need Commercial Item Support Center of Excellence Until New Policy and Processes in Place

Until recommendations to improve regulations, processes, and procedures are institutionalized with training in place to affect mindset and provide tools for commercial item support acquisition, there needs to be an organization whose primary role is to stay current with commercial item procedures, disseminate "best practices," provide telephone or on-site assistance, and assist in the development or modification of integration tools.

Establish Clear Definitions

The Air Force needs to adopt a single, CLEAR definition for the term "commercial item." Cleaer definitions of commercial item modifications (minor and major) are also required. The definitions contained in the draft DFAR dated July 11, 1990 (Subpart 211.7001) are recommended.

Analysis /Coordination Before Changing Support

Before any change is made to the support concept for a commercial item (e.g., going from contractor logistics support (CLS) to organic or from two-level to three-level maintenance, etc.), ensure thorough life cycle cost and effectiveness analyses are done and all affected commands coordinate on the decision.

Prototype New Ideas on Selected Programs

Many new approaches are being tried on programs with little or no information being available as to successes or failures. Even if this information were published, it would be hard to measure as there would be no baseline to balance it against. Controlled prototyping of new support approaches on selected programs is needed. In this way a factual analysis can be done as to whether the approach is valid/worthwhile.

Form Commercial Item Support Strategy Panel

For programs which include commercial items, form a commercial item support strategy panel (CISS Panel) composed of user, support,

and acquisition personnel to develop support requirements, support strategy based on the service life of the commercial item, and specific contractual language in support of the commercial item RFP.

Select Vendor Concept That Meets AF Needs

If the vendor has options for support, or different vendors can supply the same capability but have different support approaches, select the support approach that meets the Air Force needs. This presupposes that the Air Force has defined the optimum support approach during the requirements development phase.

Standard Base Supply System (SBSS) For Government Owned Spares

Contractor Logistics Support (CLS) for commercial items is the recommended approach. However, any government-owned spares should be entered in the SBSS for cost-effectiveness and ease of tracking accountability.

Contractor Owned and Maintained Base Supply (COMBS) and Service Contracts for Contractor-Owned Spares

Contractor Logistics Support (CLS) for commercial items is the recommended approach. When organic maintenance is being performed by the government, the contractor should own and maintain any spares needed. Also, when full contractor logistics support is supplied by the contractor at all levels of maintenance under service contracts, the contractor should own all spares.

Define Support Requirements Up Front

The level and type of support for commercial items required by the user must be clearly defined early in the decision process. The service life of each commercial item should also be established up front to facilitate life-time support planning, upgrade/replacement decisions, and budgeting requirementes to ensure the funds are available when needed for these actions.

Modular Design Approaches With Portable Software

To reduce unnecessary replacement or upgrade and system downtime, systems should be designed in such a manner that the operational software can change without affecting the application software. One method of emphasizing and achieving better system integration is to

encourage the use of modular designs which allow for change-out of commercial items without redesigning the system, customizing outside of the configuration item module, and protable software to allow for change-out of commercial items without rewriting application software. To allow for these change-outs in upgrading/replacing the system, the actual life-span of the items must be recognized when the decision is made to acquire the item and budgeting needs put in place to ensure change-outs can be accomplished in a timely manner.

Accept Commercial Support

Whether it is a vendor or a third party who has the support capability, the government should accept commercial support as it is often readily available, has a proven track record, and is competitively priced. Contractor provided data, including data on equipment usage and operation, general maintenance tips, recommended spares, etc., should be accepted in contractor format; special provisions (and cost) to procure mil-spec, government-formatted data should be avoided.

Focus on Full Scale Development (FSD) Support Objectives in Source Selection

Support objectives for commercial items needed to be addressed as part of the rationale for selecting a particular commercial item during source selection. Because commercial items are fully designed before the government awards the contract, the support objectives which are typically measured and assessed during FSD for developmental systems must be measured and assessed during source selection for commercial items.

Adapt Industry Practices

Industry accepts commercial items and commercial item support as a standard way of doing business. The government needs to adapt industry practices (e.g., linking requirements to market availability, planning upgrades/change outs based on the life span of the item, etc.) where possible.

RECOMMENDATIONS

RECOMMENDATIONS

The Study Team's recommendations are presented by category of subject matter as shown in the preceding assessment section.

GENERAL

1. Develop a new Army regulation that exclusively pertains to a commercial off-the-shelf and a nondevelopmental item approach to materiel acquisition, fielding, and sustainment.

2. Educate field users, combat developers, and materiel developers on COTS/NDI purposes, processes, and benefits, with priority to the Defense Systems Management College.

3. Strengthen the TRADOC-AMC-Industry relationship through continuous and free dialogue.

4. Ensure constant field user and combat developer participation in a system's life cycle, especially in trade-off determinations.

5. Provide senior Army leadership emphasis on COTS/NDI approaches to overcome the mindset of traditionalists deep within the acquisition system, especially as regards logistic support for COTS/NDI equipment.

6. Use commercial or non-developmental items wherever possible.

REQUIREMENTS

1. Require combat developer to provide more realistic requirements and to state them in broad functional terms.

2. Identify the program as developmental or COTS/NDI in the requirements generation process.

3. Be prepared to trade off performance characteristics to obtain a cost effective near-term capability.

4. Determine the density of the system at the outset in order to decide on the contractor support required.

5. Achieve a greater level of combat developer experience in TRADOC.

6. Ensure a continued link between the combat developer and the materiel developer throughout the materiel's life cycle, to include market analyses, support strategy, and testing.

7. Resolve the authority and responsibility issues between ODCSOPS and ODISC4 at the departmental level.

HARDWARE ENGINEERING

1. Develop COTS/NDI specifications in operational and functional terms at the system level.

2. Use COTS/NDI equipment as supporting platforms for special applications, such as work stations.

3. Eliminate unnecessary and nonoperational MILSPECs in the RFP.

4. Tailor documentation to reduce CDRLs to the absolute minimum.

5. Curtail the amount of government involvement in CDRL reviews.

6. Specify the use of commercial documentation to support system maintenance requirements.

7. Drastically reduce the reviews and processing of system change requests.

8. Restrict involvement in internal contractor documentation to the absolute minimum.

9. Foster initiatives by contractors to offer creative solutions that will meet the user's requirements.

10. Adopt industry international, and government standards in system specifications.

11. Authorize technical documentation as opposed to military technical manuals.

12. Require contractors to propose state of the art enhancements to fielded items of equipment.

SOFTWARE ENGINEERING

1. Establish a standard definition of nondevelopmental software.

2. Clearly define contractor responsibilities for software development, support, and control.

3. Clearly specify system performance requirements.

4. Develop methodologies to ensure compatibility of subsequent software enhancements through an effective configuration management process.

5. Place greater responsibility upon the contractor for the commercial software application with minimum government interference and hold him responsible and accountable for system testing and fielding.

6. Establish procedures for incorporating software changes in the PDSS phase of a program's life.

7. Change DoD specification practice guidelines to require each COTS/NDI software package to be identified as a Computer Software Configuration Item (CSCI).

8. Adopt commercial, Federal Information Processing Standards (FIPS), and International Standards for all DoD Information Systems.

9. Continue the support of software transportability through Ada language and POSIX changes.

INTEGRATED LOGISTICS SUPPORT

1. At the outset of a system's life cycle in the RFP, specify both interim and long-term support concepts (spares and maintenance) that will be the contractor's responsibility.

2. Provide for a streamlined provisioning process through the medium of an effective LSA/LSAR at an early stage.

3. Specify contractor support for COTS/NDI as a rule rather than an exception.

4. Identify and procure initial spares concurrent with the prime equipment.

5. Utilize short form provisioning parts list if long-term support is provided by the contractor.

6. Perform equal cost trade offs between the contractor and the government for long-term maintenance support.

7. Utilize existing vendor manuals whenever possible.

8. Accept commercial documentation when using contractor logistic support.

9. Develop a total training package approach with maximum contractor involvement.

10. Ensure adequate funding is provided for essential ILS.

TESTING

1. Impose only those testing requirements necessary to assure compliance with applicable product specifications.

2. Provide for an early selection of testing requirements.

3. Minimize testing of a product or component that has been used for commercial purposes.

4. Establish warranties for proven products in lieu of testing.

5. Specify constant user and combat developer involvement in testing.

6. Substitute environmental stress screening (ESS) for production reliability acceptance testing (PRAT).

7. Undertake a test-fix-test concept to find problems early and correct them as the system matures.

PROGRAM MANAGEMENT

1. Exercise disciplined up-front planning on the part of both the government and the contractor to preclude costly fielding delays. Drastically reduce the number of reviews for COTS/NDI systems.

2. Give government project leaders and program managers more authority to grant exceptions to established procedures and processes.

3. Give the contractor greater responsibility for fielding and sustainment.

4. Structure minimal and simplified review mechanisms for COTS/NDI programs.

5. Permit modifications to CDRLS after contact award where to do so makes good sense.

6. Treat contractor support as the norm for COTS/NDI equipment.

7. Provide facilities and GFE in good working order and in a timely manner.

8. Provide a representatiave of the government's PM office at the contractor's site.

9. Create a climate wherein flexibility and change to new approaches becomes the norm.

APPENDICES

APPENDIX A

APPENDIX A

TERMS OF REFERENCE

COMMERCIAL OFF-THE-SHELF/NONDEVELOPMENTAL ITEM (COTS/NDI) STUDY
by the
National Security Industrial Association (NSIA)
Command, Control, Communications, and Intelligence Committee (C^3IC)
for the
U.S. Army Communications-Electronics Command (CECOM)

GENERAL

CECOM is the National Inventory Control Point (NICP) and National Maintenance Point (NMP) for communications and electronics equipment and systems. CECOM NMP and NICP are in partnership with four separate developmental agencies. These agencies are chartered to manage development, procurement, and fielding of weapons systems. In order to accomplish all of the above, each organization is bound by rules and regulations regarding regulatory planning activities or logistical products that must be made available before a system is fielded. These rules and regulations become a paradox because the hardware is readily available, but the process of military support causes, at times, insurmountable delays affecting fielding and subsequent sustainment support.

The U.S. Army Information Systems Management Agency (ISMA) is one of the above agencies, and it is confronted with even more of a paradox regarding its systems. Its programs are high technology, with a typical density of less than ten. It has dealt in the world of Commercial Off-the-Shelf Nondevelopmental Items (COTS/NDI) communications for more than 22 years. The explosion of technology has provided new capabilities and has challenged the logistician to keep pace through innovative fielding and support techniques. This innovation in turn created stovepipe logistics systems that, over the long run, leave an unacceptable sustainability burden on the users. This is no longer acceptable, because of the reduction in manpower and funds to support these and other systems.

To redress these problems, a review and evaluation of the way CECOM, ISMA, and the Army acquire, field, and sustain COTS/NDI is needed, with the objective of developing an intelligent acquisition, fielding, and sustainment strategy for the COTS/NDI. This is to allow the Army to rapidly acquire a new system, maintain the most current technology, and keep support in the standard Army Logistics system as much as possible.

PROPOSAL

It is proposed that the NSIA C^3IC undertake a study to evaluate the effectiveness of the Army's acquisition, fielding, and sustainment strategy, as it applies to COTS/NDI systems, and recommend changes to improve its effectiveness and efficiency to ISMA and CECOM.

TERMS

In order to ensure preparation of a fully useful analysis and report, the study will be conducted in accordance with the terms defined herein.

1. The Integrated Logistics Support Directorate and ISMA will coordinate and arrange for necessary briefings, documentation, and points of contact necessary to conduct the study.

2. The study effort is undertaken at no direct cost to the government.

3. The study will provide industry's perspective on how the Army can improve its acquisition, fielding, and sustainment of COTS/NDI systems. This perspective should include the evaluation of the current method of Army COTS/NDI acquisition, which includes exploring the role of the contractor with emphasis on outlining steps that might be taken to improve the acquisition, fielding, and sustainment process for low-density equipment.

4. This effort should identify current procedures for a minimum of two COTS/NDI acquisitions, to include both hardware and software. Based upon findings, evaluate the effectiveness of the Army's current COTS/NDI acquisition process and make the results of this investigation available to the appropriate defense organization for consideration. Based upon results, develop an action plan for an enhanced COTS/NDI acquisition, fielding, and sustainment process or, at a minimum, recommendations for improvement.

5. It is expected that six to eight members will be assigned to the study committee, with the study effort to be completed within one year.

6. Selected systems will be primarily contractor supported at this time; however, they should be studied from the viewpoint of transitioning to organic support. Current policy and procedures need to be updated and established to allow for improvement.

7. Essential Elements of Analysis

- Current Army COTS/NDI acquisition methodologies and procedures.

- Current contractor COTS/NDI acquisition methodologies and procedures.

- Current fielding procedures.

- Life cycle cost implications.

- Review these documents as a minimum: AR 710-1, AR 710-2, AR 700-18, AR 700-142, AR 700-138, AR 700-127, AR 700-55, and associated DA PAMS.

- New alternatives.

APPENDIX B

APPENDIX B

NSIA COTS/NDI STUDY TEAM

GEN William R. Richardson, USA (Ret.)—Chairman
Executive Vice President, Army Programs
Burdeshaw Associates, Ltd.

Ms. Linda R. Connor—Deputy Chairman
Program Manager, Command and Control Systems Division
Rockwell International Corporation

Mr. Gerald M. Campbell
Director, Systems Support, Mobile Subscriber Equipment Division
GTE Government Systems Corporation

Mr. David E. Erickson
Program Manager, ASMPS, Information and Communications Systems
Martin Marietta Information Systems Group

Mr. Toby Kramer
Director, Engineering Support
AIL Systems, Inc.

Mr. David W. Lindsay
Business Development Manager
LORAL Command and Control Systems

LTG Emmett Paige, Jr., USA (Ret.)
President and COO
OAO Corporation

Mr. Nathan Winer
Director, C3I, Defense Communication and Navigation Systems Division
Magnavox Government and Electronics Company

Mr. Ken East (Army Representative)
Deputy Director, Logistics and Maintenance
USA CECOM

APPENDIX C

APPENDIX C

MEETINGS/BRIEFINGS

DATE	AGENCY/INDIVIDUAL	PARTICIPANTS
September 18	CECOM Mr. Jim Skurka	Study Team
October 10	OASA (RDA) Mr. George Dausman	Chairman
October 12	HQ AMC Mr. Darold Griffin	Chairman
November 27	Team Meeting BAL, Bethesda, MD	Study Team
November 28	OASD (P&L) Mr. Greg Saunders	Chairman Mr. Nate Winer
November 30	Signal School MG Pete Kind COL Bill Guerra	Chairman
December 4-5	NSIA C^3I EXCOM LTG (Ret.) Jim Brickel	Chairman Deputy Chairman
January 7	ODCSOPS, HQ DA COL John Back	Chairman
February 21	MG (Ret.) Jack Stoner	Chairman
February 26	Mr. Jim Ambrose	Chairman
March 19	Team Meeting Magnavox, Torrance, CA	Study Team
April 23-24	NSIA C^3I Excom LTG (Ret.) Jim Brickel	Chairman
June 12 NSIA	NSIA C^3I Excom LTG (Ret.) Jim Brickel	Chairman

Appendix K

CDR AMC Message, 221831Z JUL 92, Subj: Logistics Power Projection

ROUTINE

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FM CDRAMC ALEXANDRIA VA //AMCCG//
TO RUEPNIS/CDRAMCCOM ROCK ISLAND IL //AMSMC-CG//
RUCIFRO/CDRAVSCOM ST LOUIS MO //AMSAV-CG//
RUEDBIA/CDRCECOM FT MONMOUTH NJ //AMSEL-CG//
RUEPABE/CDRDESCOM CHAMBERSBURG PA //AMSDS-CG//
RUCDGDA/CDRMICOM HUNTSVILLE AL //AMSMI-CG//
RUKGWMA/CDRTACOM WARREN MI //AMSTA-CG//
RUCIFRA/CDRTROSCOM ST LOUIS MO //AMSTR-CG//
RHFJOLA/CDRSTRICOM ORLANDO FL //AMSTI-CG//
INFO RULNAPG/DIRAMSAA ABERDEEN MD //AMXSY-D//
RUEPNIL/CDRAMCISA ROCK ISLAND IL //AMXEN//
RUCIFRL/DIRSIMA ST LOUIS MO //AMXSI//
RUCDGDA/CDRUSATSG REDSTONE ARS AL //AMXTM//
RUEADWD/HQDA WASHINGTON DC //DALO-ZA//
RUKLDAR/DIRUSASLA ALEXANDRIA VA //LOSA-ZA//
BT
UNCLAS
SGD GEN ROSS, CDR AMC
SUBJECT: LOGISTICS POWER PROJECTION

GEN ROSS

1. AS WE DISCUSSED AT OUR 15-18 JUN 92 SUMMER COMMANDERS' CONFERENCE, THE NEED FOR MORE RESPONSIVE LOGISTICS TO SUSTAIN SMALLER, MORE LETHAL FORCES HAS BECOME AN IMPERATIVE. IN RESPONSE TO THIS NEED, THREE KEY INITIATIVES ARE BEING DEVELOPED TO MOVE TOTAL ARMY LOGISTICS INTO THE 21ST CENTURY. THE FIRST TWO WILL, IF APPROVED, SUBSTANTIALLY EXTEND AND EXPAND AMC'S ROLE BY PROVIDING SUSTAINMENT, SUPPLY AND MAINTENANCE SUPPORT DOWN TO AND AT THE INSTALLATION LEVEL. THEY WILL IMPROVE OUR ABILITY TO LATERALLY MOVE SUPPLIES AND ENHANCE TAILORED MAINTENANCE SUPPORT FOR MORE EFFICIENT UNIT READINESS, SUSTAINMENT, AND CONTINGENCY OPERATIONS. THESE INITIATIVES ARE:
A. SINGLE STOCK FUND (SSF): SSF WILL INTEGRATE WHOLESALE AND RETAIL STOCK FUNDS UNDER AMC OWNERSHIP. THIS WILL STREAMLINE SUPPLY AND FINANCIAL PROCESSES, PROVIDE INCREASED VERTICAL/HORIZONTAL ASSET VISIBILITY, THEREBY INCREASING RESPONSIVENESS OF SUPPLY SUPPORT AT BOTH THE INSTALLATION AND DEPOT LEVELS.
B. INTEGRATED SUSTAINMENT MAINTENANCE (ISM): ISM PROVIDES FOR INTEGRATION OF ALL MAINTENANCE ABOVE DIRECT SUPPORT (DS) UNDER AN INTEGRATED SUSTAINMENT MAINTENANCE MANAGER (ISMM). THE ISMM WILL COMMUNICATE TO NATIONAL LOGISTICS RESOURCES AND SUPPORT THE THEATER/INSTALLATION COMMANDERS REAL TIME LINES OF LOGISTICAL POWER PROJECTION NEEDS OF OUR SMALLER ARMY. A SUSTAINMENT MANAGER AT INSTALLATION LEVEL WILL PERFORM TIMELY SUPPORT REPAIRS AT LOCAL RATES WHILE MAINTAINING DIRECT LINKAGE TO THE ARMY'S WHOLESALE LOGISTICS BASE.
2. THE THIRD INITIATIVE, FORWARD REPAIR ACTIVITY (FRA), WILL SERVE AS A DEPOT LEVEL REPAIR SUBSET OF ISM AND WILL STANDARDIZE COMMAND AND CONTROL OF DEPOT LEVEL REPAIR MOVED FORWARD TO SUSTAIN KEY, HIGH TECH, HIGH DOLLAR, LOW DENSITY ITEMS. PROVEN IN OPERATION DESERT STORM, THIS STRUCTURE REDUCED TRANSPORTATION DELAYS AND IMPROVED WEAPON SYSTEM AVAILABILITY BY MOVING DIAGNOSTICS AND REPAIR CLOSER TO THE POINT OF FAILURE. PEACETIME COST REDUCTIONS ARE ALSO PROVIDED THROUGH REDUCED "PIPELINE BUYOUT" OF EXPENSIVE COMPONENTS.
3. THESE INITIATIVES ARE CRITICAL TO IMPROVING RESPONSIVENESS TO MEET THE NEEDS OF A SUSTAINABLE TRAINED AND READY FORCE. THEY ARE ESSENTIAL TO MEETING OUR LOGISTICS POWER PROJECTION REQUIREMENTS. YOUR SUPPORT IN THE FOLLOWING AREAS WILL SERVE TO ENSURE
A. PROMOTE THOSE ACTIONS THAT WILL PROVIDE THE BEST STEWARDSHIP OF THE ARMY'S RESOURCES AND KEEP PAROCHIAL INTERESTS FULLY IN PROSPECTIVE WITH THIS OVERALL OBJECTIVE.
B. SUPPORT DEMONSTRATION OF SSF AND ISM UNDER THE LEAD OF THE

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PAGE 02 OF 02 RUKLDAR 7299 042050 22/2248Z
STRATEGIC LOGISTICS AGENCY (SLA). EXPECT THE DEMONSTRATION OF SSF TO START OCT-DEC 92 TIME FRAME AND THE ISM DEMONSTRATION TO START 3-6 MONTHS LATER.
C. IDENTIFY PROCEDURAL AND SYSTEMS ISSUES RELATED TO THE ESTABLISHMENT OF AN SSF AS WE REFINE AND DEVELOP THIS CONCEPT WHEREBY AMC MANAGERS WILL BE RESPONSIBLE FOR MANY FUNCTIONS NOW PERFORMED AT RETAIL LEVEL. THIS INVOLVES A NEW WAY OF DOING BUSINESS THAT WE MUST UNDERSTAND AND PERFORM EFFICIENTLY.
4. MG TOM ARWOOD, AMC DCSLOG, IS WORKING WITH SLA AND HQDA ODCSLOG TO ESTABLISH A CHARTER FOR AN ISSM TO EXERCISE OVERALL MANAGEMENT OF ISM AND THE INTEGRATION OF COLLOCATED FRA OPERATIONS. FOR PLANNING PURPOSES, THE ISMM WILL BE THE INDUSTRIAL OPERATIONS COMMAND (IOC), ROCK ISLAND, IL. DESCOM WILL PERFORM THE FUNCTION UNTIL THE IOC IS OPERATIONAL. OVER TIME, OUR ISM AND FRA CONCEPTS OF OPERATION WILL BE REFINED TO NAIL DOWN HOW WE CAN MOST EFFECTIVELY MANAGE ORGANIC AND/OR CONTRACT MAINTENANCE OPERATIONS THROUGH CENTRALIZED PROCESSES AT INSTALLATION LEVEL AND ENSURE APPROPRIATE OPERATIONAL POWER PROJECTION LINKS BETWEEN WHOLESALE BASE AND DEPLOYABLE FORCE.
5. AGAIN THESE INITIATIVES PROVIDE THE MEANS TO MEET OUR LOGISTICS POWER PROJECTIONS NEEDS OF THE FUTURE. DURING MOBILIZATION, MAINTENANCE SUPPORT WILL BE TAILORED AND MELD INTO THE AMC LOGISTICS SUPPORT GROUP (LSG) STRUCTURE WHICH IS BEING DESIGNED FOR DEPLOYMENT TO MEET CONTINGENCIES ANYWHERE IN THE WORLD. THE LSG CONCEPT IS PRESENTLY BEING STAFFED FOR INCORPORATION INTO ARMY DOCTRINE. THESE INITIATIVES PROVIDE AN EQUALLY CRITICAL CONTRIBUTION TO ACHIEVING A VARIETY OF DEFENSE MANAGEMENT REPORT DECISION (DMRD) SAVINGS THAT HAVE ALREADY BEEN LEVIED ON THE ARMY'S TOTAL OBLIGATION AUTHORITY (TOA) THROUGH FY97.
6. SSF, ISM AND FRA ARE THREE OF THE ARMY'S HIGHEST PRIORITY PROGRAMS. MG ARWOOD, IS DESIGNATED AMC LEAD TO ENSURE SUCCESSFUL IMPLEMENTATION. HIS PROJECT OFFICER IS COL B. BRYANT, DSN 284-9893, MR. S. NICHOL, DSN 284-9685 IS TEAM LEADER FOR ISM AND MR. FRED LLOYD, DSN 284-8866 IS TEAM LEADER FOR SSF. I AM COUNTING ON YOUR WHOLEHEARTED SUPPORT TO MAKE THESE INITIATIVES HAPPEN DURING MY TENURE AS COMMANDER OF AMC.
BT
#7299
NNNN

GEN ROSS

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Appendix L

IEW Streamlining - Minutes of General Officer Steering Committee Briefing (16 Oct 92)

SELIM-IEW

MEMORANDUM FOR RECORD

SUBJECT: IEW Streamlining - Minutes of General Officer Steering Committee Briefing (16 Oct 92)

1. This memorandum furnishes subject minutes for information, documentation, and necessary action.

2. A copy of the attendee list is at Enclosure 1.

3. Minutes herein reflect general administrative information and detailed discussions.

4. **General Administrative Information**

a. The General Officer Steering Committee (GOSC) briefing was conducted at the Pentagon, Washington, DC, from 1300 to 1430, 16 Oct 92.

b. The briefing was conducted to provide senior personnel of Headquarters, Department of the Army, and the participating organizations the following:

(1) an opportunity to hear and discuss the study briefing

(2) an opportunity to hear and discuss MACOM positions and resolve outstanding issues

(3) an opportunity to approve the study recommendations

c. Attendees provided self-introductions.

5. **Detailed Discussion**

a. **IEW Streamlining Study Briefing.** Mr. Dutton presented the study briefing for review and approval. Appendix G of Volume I, Sustainment Analysis Report, contains copies of the GOSC briefing graphics.

b. **Army Space Programs Office (ASPO).** ASPO was not represented on the study group. ASPO representatives at this briefing indicated they were concerned with readiness and security issues. The GOSC indicated that readiness concerns were not valid reasons in and of themselves to exempt systems from the streamlined IEW sustainment system since the new system will be designed and resourced to support high readiness rates. Furthermore, the recommended system will permit exceptions to the standard support structure for specific systems when justified and properly approved.

c. **Recommendations.** There were some recommendations to amend some of the graphics to improve reader understanding; the versions in Appendix G of Volume I, Sustainment Analysis Report, have been changed to incorporate the recommendations.

d. **IMPLEMENTATION RESOURCES chart.** Discussion on this chart included the following:

(1) CIMMC hiring authority is an internal AMC issue

(2) Mr. Neal indicated SLA will work the automation funding issue regarding CCSS and SDS

(3) funding for travel is an internal AMC issue

(4) ODCSLOG will take action on the DBOF conversion issue

e. **KEY IMPLEMENTATION TASKS Chart.** In response to questions regarding the implementation plan, there will be an implementation plan for the demonstration as well as a separate implementation plan for the approved IEW Streamlining study recommendations. Mr. Neal suggested that implementation of a number of the recommendations could proceed without regard to the demonstration, particularly if tied to the ISM demo.

f. **Conclusion.** All GOSC members concurred with the recommendations presented and approved forwarding them to the VCSA through Commander, AMC. Mr. Davis characterized the new concept as outstanding work, efficient, and pragmatic. Mr. Mills concurred and recommended resolving the multiple pricing issues in the stock fund and ASPO's concerns. Mr. Neal recommended expeditious implementation. Mr. Bair agreed with Mr. Neal. Mr. St. James concurred for TRADOC. Mr. Bazemore concurred for INSCOM. FORSCOM and PEO-IEW have previously concurred in writing.

IEW STREAMLINING STUDY
GOSC BRIEFING

List of Attendees

October 16, 1992

Attendee	Office	Telephone Number
Mr. David Mills	HQDA (DALO-SMZ-B)	DSN 227-5411
Mr. William Neal	SLA	DSN 284-4480
Mr. James D. Davis	HQDA (DAMI-ZD)	DSN 227-4644
Mr. Ronald Treusdell	HQ, AMC	703-274-9718
Mr. James M. Skurka	HQ, CECOM	DSN 992-2806
COL Marcum	HQDA (DAMO-FD)	DSN 227-6527
COL Dunigan	USASOC, DCSLOG	DSN 239-3411
Mr. Eddie Bair	PEO-IEW	DSN 992-0181
Mr. Larry Scheuble	Dir, CIMMC	DSN 229-5011
Mr. Richard Serrentino	FORSCOM (J4-SM)	DSN 367-7284
Mr. Roy Bazemore	INSCOM (IALOG-RA)	DSN 229-2840
Mr. Robert St. James	TRADOC, USAISD	DSN 256-2508
MAJ Brad Andrew	HQDA (DAMO-FDI)	DSN 227-6527
LTC Pat Riggs	HQDA (DAMO-FDI)	703-695-4221
Mr. Donald Demchak	HQDA (DALO-SMC)	DSN 225-3280
Mr. Helmut Schelenz	HQDA (DALO-SMC)	DSN 225-3280
Mr. Greg Boddorf	HQDA (DALO-RMI)	703-697-3122
Ms. Sue L. Baker	CIMMC (SELIM-P)	DSN 229-5051
Mr. Dennis Dutton	CIMMC (SELIM-IEW)	DSN 229-5248
Mr. Glenn Taillie	CIMMC (SELIM-IEW)	DSN 229-6122
CPT John Loomis	CIMMC (SELIM-IEW)	DSN 229-5253
Mr. Elmer Smith	USASOC, DCSLOG	DSN 239-3411
Mr. Marvin Isom	HQ AMC (AMCLG-SA)	DSN 284-5464
Mr. Bill Shelton	HQ AMC (AMCLG-SA)	DSN 284-9311
Mr. Dave Irvin	HQDA (DAMO-FDX)(ASPO)	703-285-9036
Mr. Bob King	HQDA (DAMO-FDX)(ASPO)	703-285-9035
Mr. Bruce Fry	HQDA (DAMO-FDX)(ASPO)	703-285-9037
Mr. David Nicholas	BDM International	804-596-6843
Mr. Robert Klebo	BDM International	804-596-6843
Mr. David Condit	BDM International	DSN 229-5262

Enclosure 1 to IEW Streamlining Study
GOSC Briefing Minutes, October 16, 1992

Appendix M

CIMMC MFR, 19 Oct 92, Subj: GOSC Concurrence, IEW Sustainment Streamlining Brief

DEPARTMENT OF THE ARMY
U.S. ARMY CECOM INTELLIGENCE MATERIEL MANAGEMENT CENTER
VINT HILL FARMS STATION
WARRENTON, VIRGINIA

22186-5277

REPLY TO
ATTENTION OF

SELIM-IEW

19 OCT 1992

MEMORANDUM FOR RECORD

SUBJECT: GOSC Concurrence, IEW Sustainment Streamlining Brief

1. On 16 October 92, USACIMMC briefed the DA GOSC on final results of the IEW Sustainment Streamlining Study. All participating MACOM representatives were present (see attendance roster, encl 1).

2. GOSC members concurred with all study findings and recommendations (see brief, encl 2) except for the following changes:

a. Chart 11 (16GOB-11), Facts #1. All three bullets under Army Stock Fund changed to indicate "Army wide" problem, as opposed to "IEW unique" on bullet two.

b. Chart 26 (16GOB-27), Key Implementation Tasks. Changed sub-bullets under "Conduct Concept Demonstration" to "Site TBD (Tied to ISM Demonstration)" and "Korea (501st/102nd), Germany (204th), VHFS (201st).

c. Chart 30 (RECOMM2), Recommendations. Third bullet under "EAC Support" changed from "Maintain a Mission SSA" to "Establish a Mission SSA". Fourth bullet under "EAC Support", deleted "(SLA 2 Price AMDF).

3. POC is CPT Loomis, DSN 229-5253, or Mr. Dutton, DSN 229-5248.

4. CECOM Bottom Line: THE SOLDIER.

5. <u>Coordination:</u>

Mr. A. David Mills, HQDA, ADSCLOG

CONCUR ______________________ NONCONCUR ______________________

19 Oct 92

Mr. James Davis, HQDA, ADSCINT

CONCUR ______________________ NONCONCUR ______________________

DEPARTMENT OF THE ARMY
U.S. ARMY CECOM INTELLIGENCE MATERIEL MANAGEMENT CENTER
VINT HILL FARMS STATION
WARRENTON, VIRGINIA
22186-5277

REPLY TO
ATTENTION OF

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4. CECOM Bottom Line: THE SOLDIER.

5. <u>Coordination:</u>

Mr. A. David Mills, HQDA, ADSCLOG

CONCUR ____________________ NONCONCUR ____________________

Mr. James Davis, HQDA, ADSCINT

CONCUR James Davis 20/10/92 NONCONCUR ____________________

SELIM-IEW
SUBJECT: GOSC Concurrence, IEW Susutainment Streamlining Brief

BG Ronald E. Adams, Director of Requirements, ODCSOPS-SD

CONCUR ______________ NONCONCUR ______________

Mr. William Neal, SLA, Director

CONCUR William Neal NONCONCUR ______________

Mr. Ronald Treusdell, HQ USAMC, ADCSLOG

CONCUR Ronald S. Trusdell NONCONCUR ______________

Encl
GOSC Attendance Roster
IEW Sustainment Streamlining
Study Final Briefing

Larry D. Scheuble
LARRY D. SCHEUBLE
Director, Intelligence Material
Management Center

[NOTE: As of November 19, 1992 the study is awaiting concurrence from ODCSOPS (DAMO-FD).]